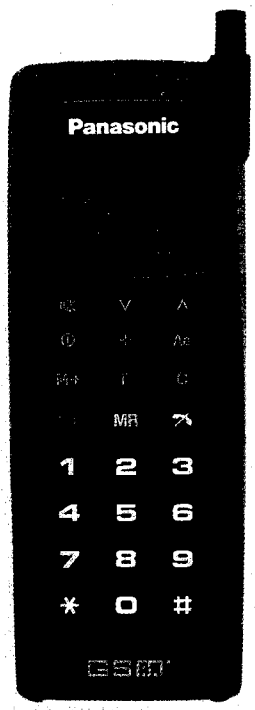
MCUK 931101C2

# Service Manual

EU 2000 Personal Cellular Phone

Handportable
**EB-3810**
Handsfree Unit
**EB-J10307**
Booster
**EB-U10076**




**Panasonic**

MCUK-TSD-005 SM Iss 1 Rev 0

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Comments or correspondence concerning this manual should be addressed to:

Technical Support,
Matsushita Communication Industrial UK Ltd.,
Colthrop,
Thatcham,
Newbury, Berks.
RG13 4NN
ENGLAND

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# Amendment Record

The information provided in this Service Manual is issued at November 1993. Amendments to this manual will be promulgated by the issue of an Amendment Instruction Sheet, together with amended sheets for insertion into the manual. Carry out the amendment instructions and enter the appropriate details in the Amendment Record below.

| Amendment No. | Amended By | Date |
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# WARNINGS AND CAUTIONS

1. The equipment described in this manual contains polarised capacitors utilising liquid electrolyte. These devices are entirely safe provided that neither a short-circuit nor a reverse polarity connection is made across the capacitor terminals. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN DAMAGE TO THE EQUIPMENT OR, AT WORST, POSSIBLE INJURY TO PERSONNEL RESULTING FROM ELECTRIC SHOCK OR THE AFFECTED CAPACITOR EXPLODING. EXTREME CARE MUST BE EXERCISED AT ALL TIMES WHEN HANDLING THESE DEVICES.

2. The equipment described in this manual contains electrostatic sensitive devices (ESDs). Damage can occur to these devices if the appropriate handling procedure is not adhered to.

3. **ESD HANDLING PRECAUTIONS**

The following antistatic handling precautions must be observed to prevent possible damage.

**SPECIAL HANDLING AREA (SHA)**

A working area where ESD sensitive devices may be safely handled without undue risk of damage from electrostatic discharge, must be available. The area must be equipped as follows:

(1) Working Surfaces - All working surfaces must have a dissipative bench mat, SAFE FOR USE WITH LIVE EQUIPMENT, connected via a 1 MΩ resistor (usually built into the lead) to a common ground point.

(2) Wrist Strap - A quick release skin contact device with a flexible cord, which has a built in safety resistor of between 5 kΩ and 1 MΩ shall be used. The flexible cord must be attached to a dissipative earth point.

(3) All containers and totage must be of the conductive type.

# 1. INTRODUCTION

This manual describes the information and procedures required for installing and servicing the Panasonic GSM EU2000 digital cellular handportable telephone, designed to operate on the GSM system.

The service manual provides the following information:

(1) General information on the EU2000 equipment, kits and options, together with information and detailed drawings on the major components of the EU2000 system.

(2) Installation information to provide information on vehicle installing using the car mount options.

(3) Operating Instructions

(4) Servicing information, providing instructions for testing and repairing the major components of the EU2000 system. This includes troubleshooting information to facilitate fault identification. Test information enables verification of equipment operation following test and repair.

The procedures described in this manual shall be performed by qualified service personnel, at an authorised service centre.

# 2. GENERAL DESCRIPTION

This chapter provides a general description and kit composition details, including the Vodac variant, for the GSM handportable telephone system and optional kits.

The GSM handportable may be configured as:

(1) Handportable unit (class 4)

(2) Vehicle powered (DC adaptor) handportable unit (class 4)

(3) Handsfree vehicle mounted unit with booster (class 2).

Rapid charger and extension cables are also available.

## 2.1 HANDPORTABLE MAIN KIT (Figure 1)

The handportable main kit provides a standalone class 4 GSM telephone. The plug-in SIM, which fits into the back of the unit (see operating instructions, Chapter 3) contains the subscriber and network information necessary to operate the phone on a GSM network.

The main unit may be powered from a vehicle battery using one of the car mount option kits.

The dual trickle charger allows the battery to be charged either on or off the telephone. Charge time is 8 hours for either size of battery.

The main kits are supplied with either a 2 or 3 pin AC adaptor.

## 2.2 HANDSFREE CAR MOUNT KIT (Figure 2)

The handsfree car mount kit enables the telephone to be used as a class 2 mobile, in handsfree mode, using a separate booster.

The handsfree cradle unit contains a speaker, with separate volume control. Speech is via a microphone mounted on the dash, or the sun visor.

The handsfree cradle doubles as a battery charger when the phone is not in use but with the ignition switched on. Whilst the telephone is on the cradle it will be charged constantly. Charging will stop whilst the telephone is in use. Charge time is 60 minutes for a 500 mAh battery and 80 minutes for a 900 mAh battery.

An extension cable kit is available for mounting the booster unit up to 5 metres from the handsfree cradle, see Figure 3.

## 2.3 DC ADAPTOR KIT (Figure 4)

The DC adaptor kit is used in conjunction with the main kit to enable the telephone to be powered from a vehicle battery, provided the vehicle has a cigar lighter socket. This configuration gives class 4 operation.

The DC adaptor replaces the standard battery. The plug fits into the cigar lighter socket and the adjustable angle bracket and cradle are fixed to a convenient location in the vehicle.

## 2.4 RAPID CHARGER KIT (Figure 5)

The dual rapid charger allows the battery to be charged either on or off the battery. Charge time is 60 minutes for a 500 mAh battery and 90 minutes for a 900 mAh battery. If two batteries are charged simultaneously, the charge time will be the sum of the individual charge times.

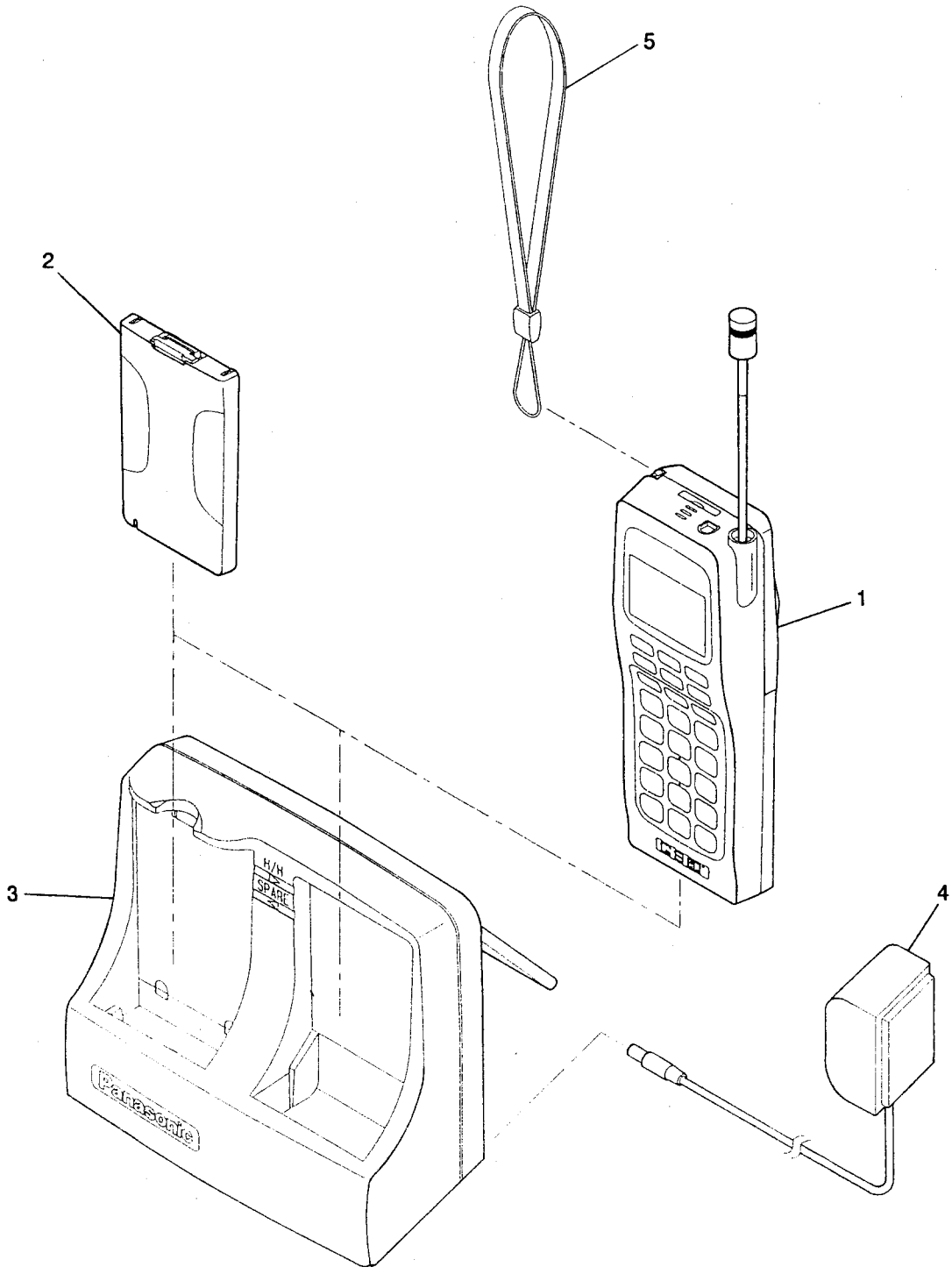
## 2.5 KIT COMPOSITIONS

**Table 2.1 Panasonic Kit Details**

| UNIT NAME AND NUMBER | KIT CONTENTS | |
|---|---|---|
| Main Unit Kit, EB-KJ3810 - UK Version | EB-3810 | Main Unit |
| | EB-P10181 | Battery (500 mAh) |
| | EB-P10155 | Dual Trickle Charger |
| | EB-P0380 | AC-adaptor 1 (3 pin) |
| | EB-Y10079 | Connector cap |
| | EB-B10023 | Carry strap |
| | EB-N70008 | SIM removal tool |
| | EB-Z11888 | Operating instructions |
| Main Unit Kit, EB-KJ3810 - European Version | EB-3810 | Main Unit |
| | EB-P10181 | Battery (500 mAh) |
| | EB-P10155 | Dual Trickle Charger |
| | EB-P0981 | AC-adaptor 1 (2 pin) |
| | EB-Y10079 | Connector cap |
| | EB-B10023 | Carry strap |
| | EB-N70008 | SIM removal tool |
| | EB-Z11888 | Operating instructions |
| Main Unit Kit, EB-KJ3810 - Australian Version | EB-3810 | Main Unit |
| | EB-P10181 | Battery (500 mAh) |
| | EB-P10155 | Dual Trickle Charger |
| | EB-P70026 | AC-adaptor 1 |
| | EB-Y10079 | Connector cap |
| | EB-B10023 | Carry strap |
| | EB-N70008 | SIM removal tool |
| | EB-Z11888 | Operating instructions |
| Handsfree Car Mount Kit, EB-KJ0242 | EB-J10307 | Handsfree Unit |
| | EB-U10076 | Booster |
| | EB-M1177 | Microphone |
| | EB-N0001 | Adjustable angle bracket |
| | EB-W10032 | RF Cable (3.5 m) |
| | EB-W10128 | P/S Cable (3.5 m) |
| DC Adaptor Kit, EB-KJ0243 | EB-P10290 | DC adaptor |
| | EB-J10351 | Cradle |
| | EB-N0001 | Adjustable angle bracket |
| Rapid Charger Kit, EB-KJ0254 - UK Version | EB-P10288 | Rapid charger |
| | EB-P10408 | AC-adaptor 2 (3 pin type) |
| Rapid Charger Kit, EB-KJ0254 - European Version | EB-P10288 | Rapid charger |
| | EB-P10322 | AC-adaptor 2 (2 pin type) |
| Rapid Charger Kit, EB-KJ0254 - Australian Version | EB-P10288 | Rapid charger |
| | EB-P70028 | AC-adaptor 2 |
| Extension Cable Kit, EB-KJ0249 | EB-W10086 | Interconnecting cable extension |
| | EB-W10127 | Power supply cable extension |
| | EB-W10035 | RF cable extension |
| Optional Accessories | EB-P10154 | Battery (900 mAh) |
| | EB-B10057 | Carry bag |

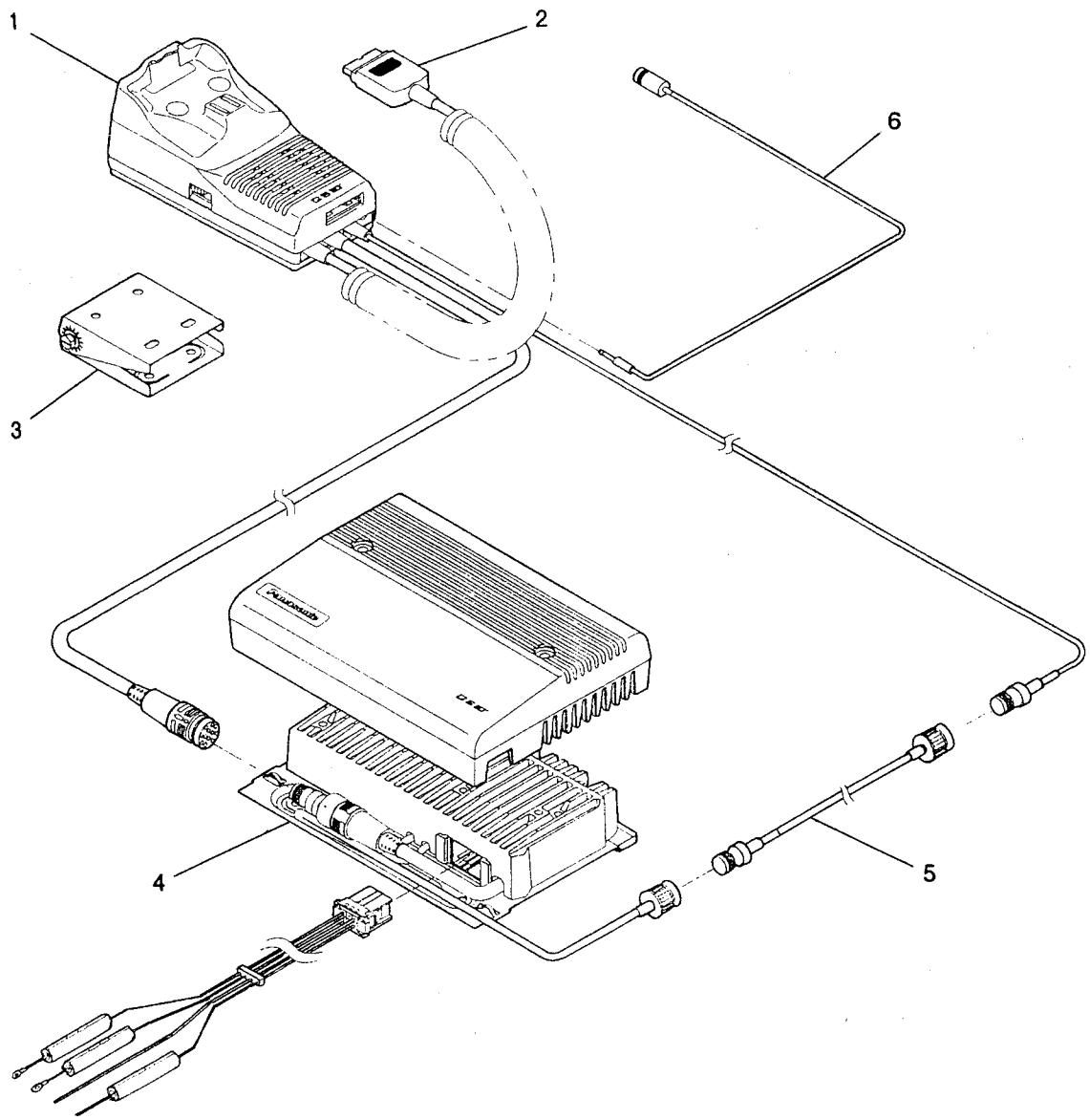
**Table 2.2 Vodac Kit Details**

| UNIT NAME AND NUMBER | KIT CONTENTS | |
|---|---|---|
| Main Unit Kit, EB-KJ3811 - UK Version | EB-3811 | Main Unit |
| | EB-P10182 | Battery (500 mAh) |
| | EB-P10161 | Dual Trickle Charger |
| | EB-P0381 | AC-adaptor 1 (3 pin) |
| | EB-Y10079 | Connector cap |
| | EB-B10023 | Carry strap |
| | EB-N70008 | SIM removal tool |
| | EB-Z12947 | Operating instructions |
| Main Unit Kit, EB-KJ3811 - European Version | EB-3811 | Main Unit |
| | EB-P10182 | Battery (500 mAh) |
| | EB-P10161 | Dual Trickle Charger |
| | EB-P70017 | AC-adaptor 1 (2 pin) |
| | EB-Y10079 | Connector cap |
| | EB-B10023 | Carry strap |
| | EB-N70008 | SIM removal tool |
| | EB-Z12947 | Operating instructions |
| Main Unit Kit, EB-KJ3811 - Australian Version | EB-3811 | Main Unit |
| | EB-P10182 | Battery (500 mAh) |
| | EB-P10162 | Battery (900 mAh) |
| | EB-P10161 | Dual Trickle Charger |
| | EB-P70027 | AC-adaptor 1 |
| | EB-Y10079 | Connector cap |
| | EB-B10023 | Carry strap |
| | EB-N70008 | SIM removal tool |
| | ZD70086A | Operating instructions |
| Handsfree Car Mount Kit, EB-KJ0262 | EB-J10637 | Handsfree Unit |
| | EB-U10109 | Booster |
| | EB-M1177 | Microphone |
| | EB-N0001 | Adjustable angle bracket |
| | EB-W10032 | RF Cable (3.5 m) |
| | EB-W10128 | P/S Cable (3.5 m) |
| DC Adaptor Kit, EB-KJ0264 | EB-P10428 | DC adaptor |
| | EB-J10351 | Cradle |
| | EB-N0001 | Adjustable angle bracket |
| Rapid Charger Kit, EB-KJ0263 - UK Version | EB-P10426 | Rapid charger |
| | EB-P10427 | AC-adaptor 2 (3 pin type) |
| Rapid Charger Kit, EB-KJ0263 - European Version | EB-P10426 | Rapid charger |
| | EB-P70018 | AC-adaptor 2 (2 pin type) |
| Rapid Charger Kit, EB-KJ0263 - Australian Version | EB-P10426 | Rapid charger |
| | EB-P70029 | AC-adaptor 2 |
| Extension Cable Kit, EB-KJ0265 | EB-W10086 | Interconnecting cable extension |
| | EB-W10127 | Power supply cable extension |
| | EB-W10035 | RF cable extension |
| Optional Accessories | EB-B10066 | Carry bag |



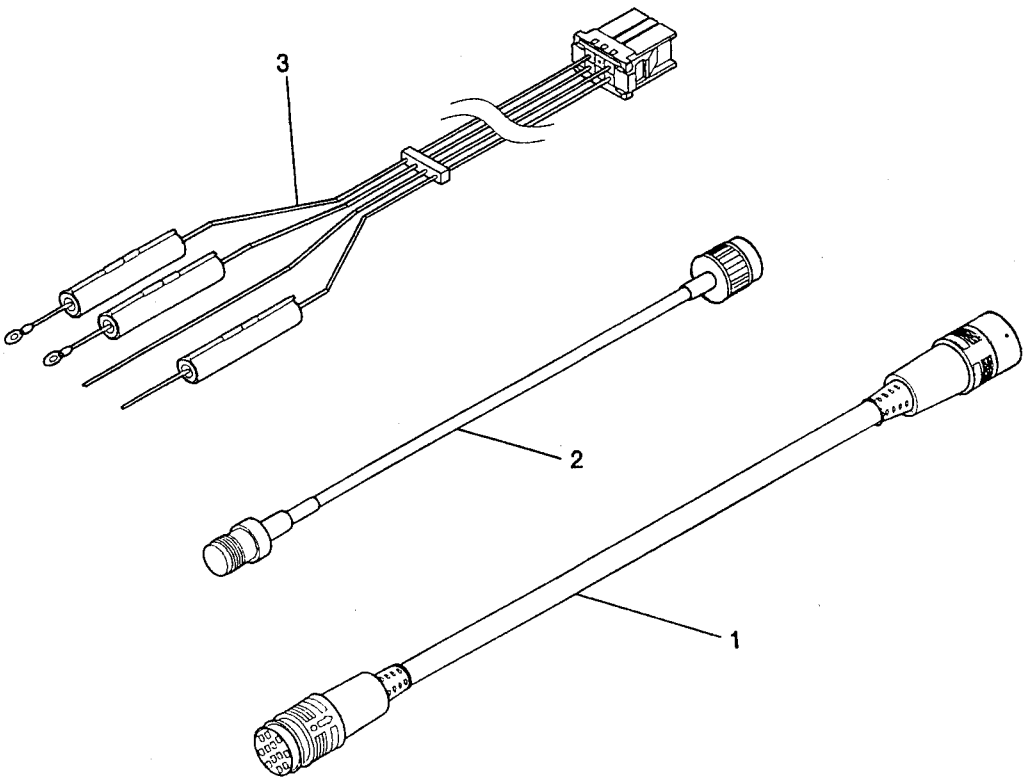

| IDENT No. | DESCRIPTION | PART NUMBER |
|---|---|---|
| 1 | Main Unit | EB-3810 |
| 2 | Battery | EB-P10181 |
| 3 | Dual Trickle Charger | EB-P10155 |
| 4 | AC Adaptor 1 | |
| 5 | Strap | EB-B10023 |

**Figure 1 Handportable Main Unit Kit, EB-KJ3810**



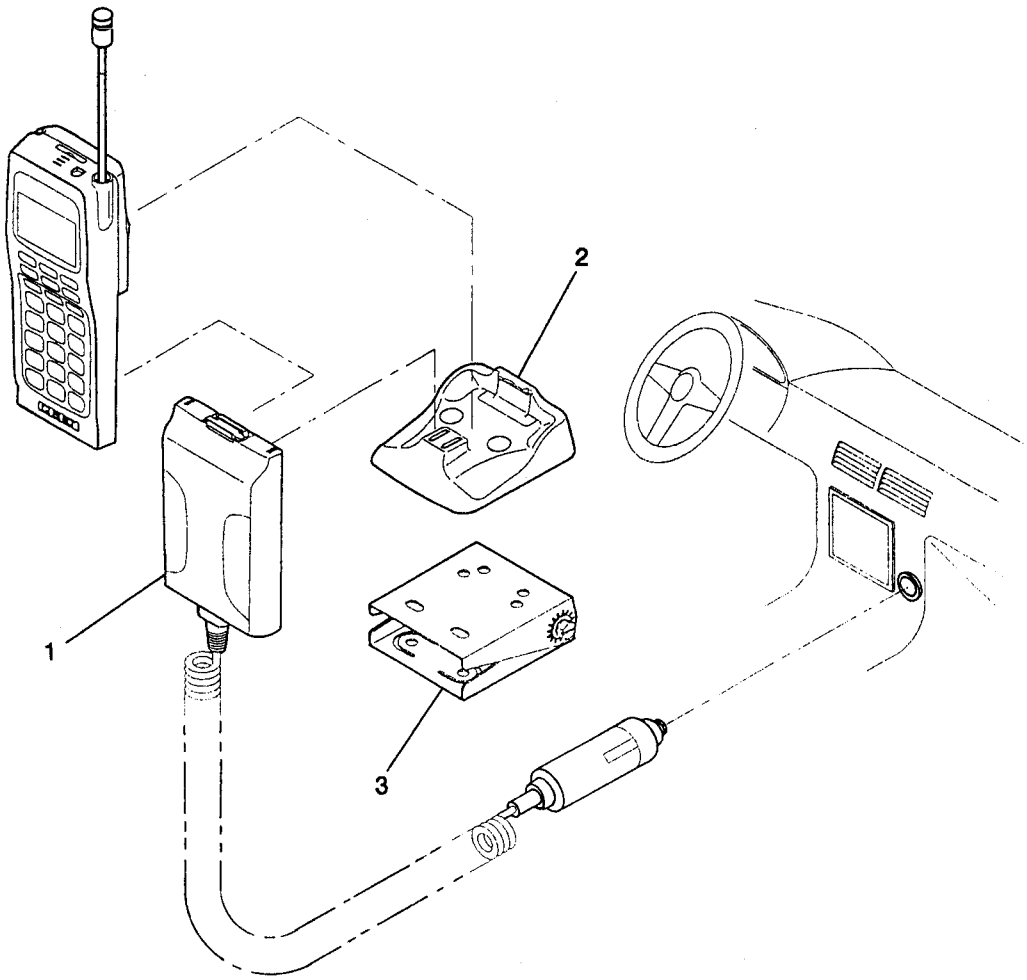

| IDENT No. | DESCRIPTION | PART NUMBER |
|---|---|---|
| 1 | Handsfree Unit | EB-J10307 |
| 2 | Handsfree Cradle | EB-J10351 |
| 3 | Adjustable Angle Bracket | EB-N0001 |
| 4 | Booster | EB-U10076 |
| 5 | Cables | EB-W10108 |

**Figure 2 Handsfree Car Mount Kit, EB-KJ0242**



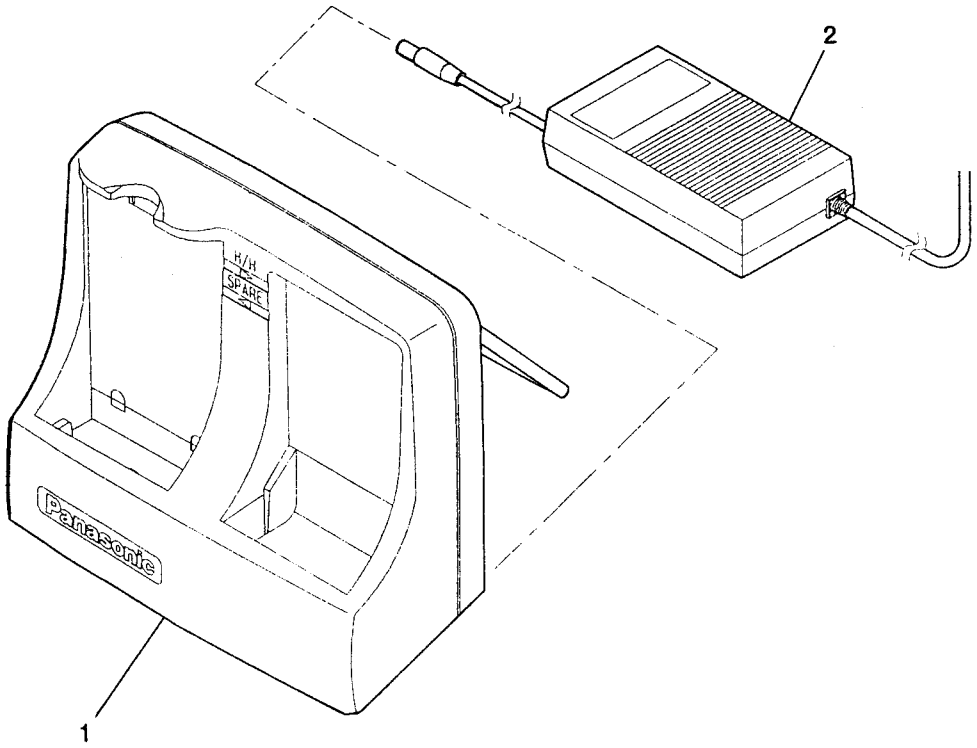

| IDENT No. | DESCRIPTION | PART NUMBER |
|---|---|---|
| 1 | Ext I/C Cable (1.5m) | EB-W10086 |
| 2 | Ext RF Cables (5m) | EB-W10035 |
| 3 | Ext PS Cable (7m) | EB-W10127 |

**Figure 3 Extension Cable Kit, EB-KJ0249**



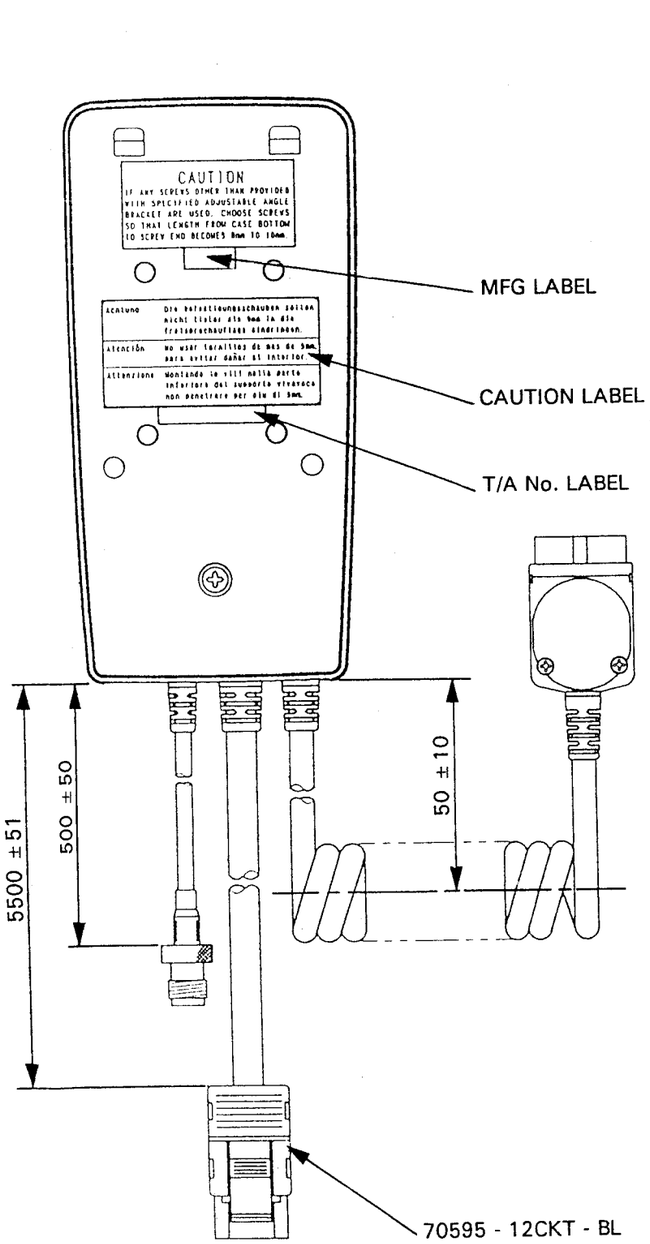

| IDENT No. | DESCRIPTION | PART NUMBER |
|---|---|---|
| 1 | DC Adaptor Unit | EB-P10290 |
| 2 | Cradle | EB-J10351 |
| 3 | Adjustable Angle Bracket | EB-N0001 |

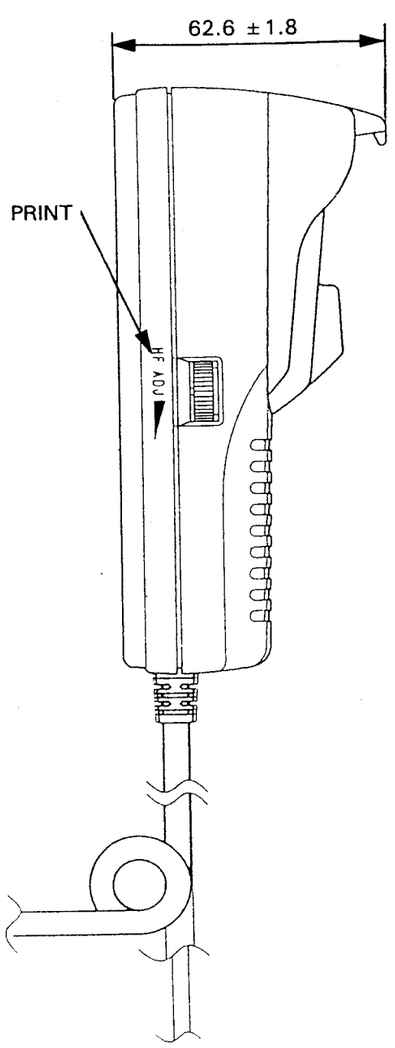
**Figure 4 DC Adaptor Kit, EB-KJ0243**

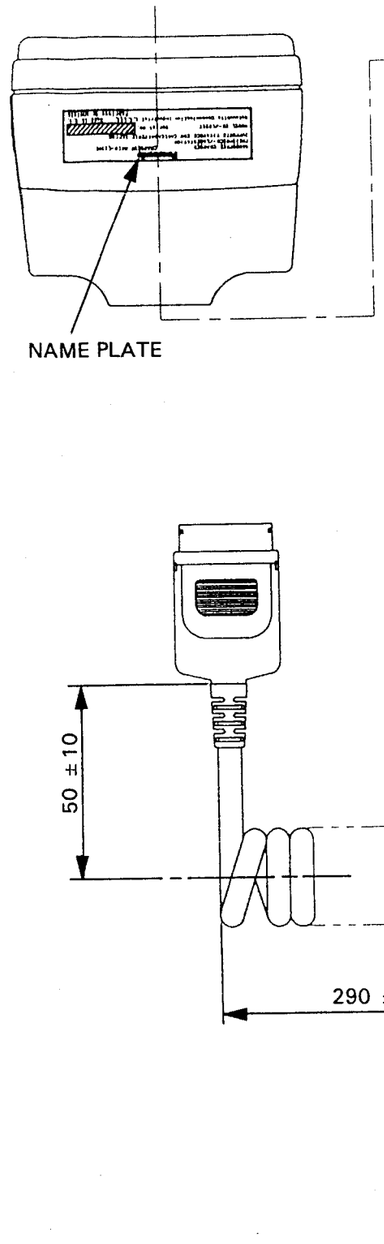


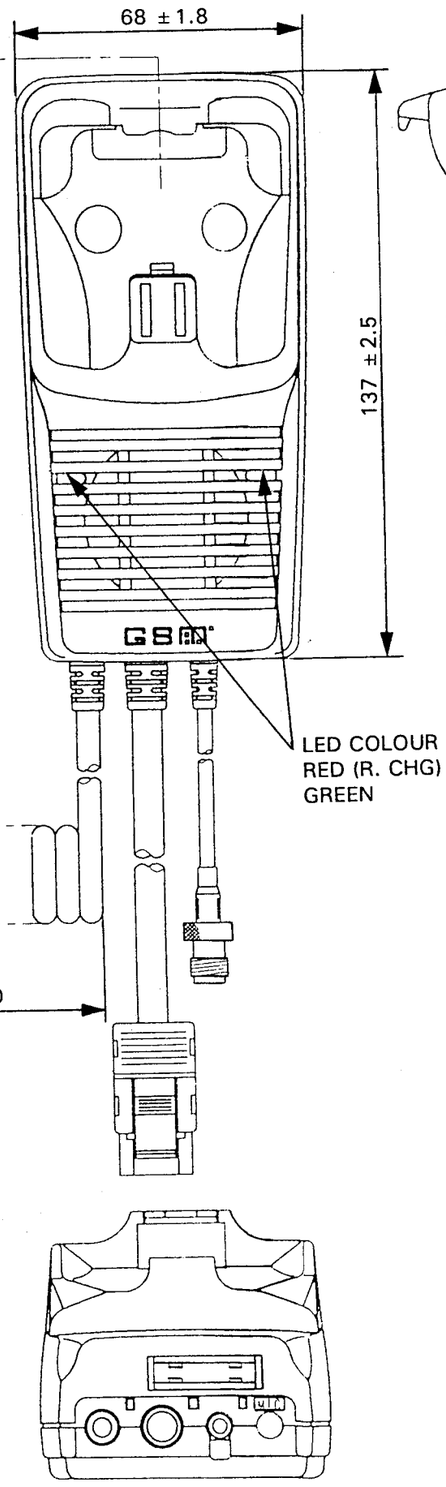

| IDENT No. | DESCRIPTION | PART NUMBER |
|---|---|---|
| 1 | Dual Rapid Charger Unit | EB-P10288 |
| 2 | AC Adaptor 2 | |

**Figure 5 Rapid Charger Kit (Main Unit Kit), EB-KJ10288**



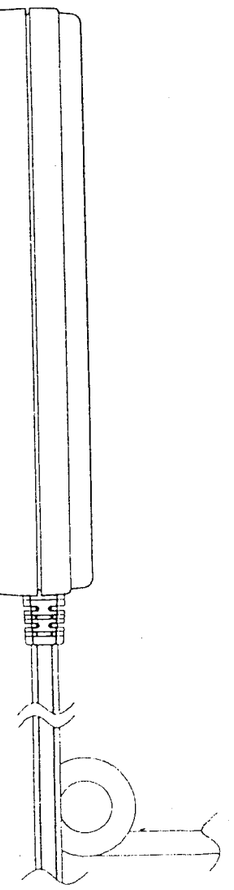



**Figure 7 Handsfree Cradle, EB-J10307**

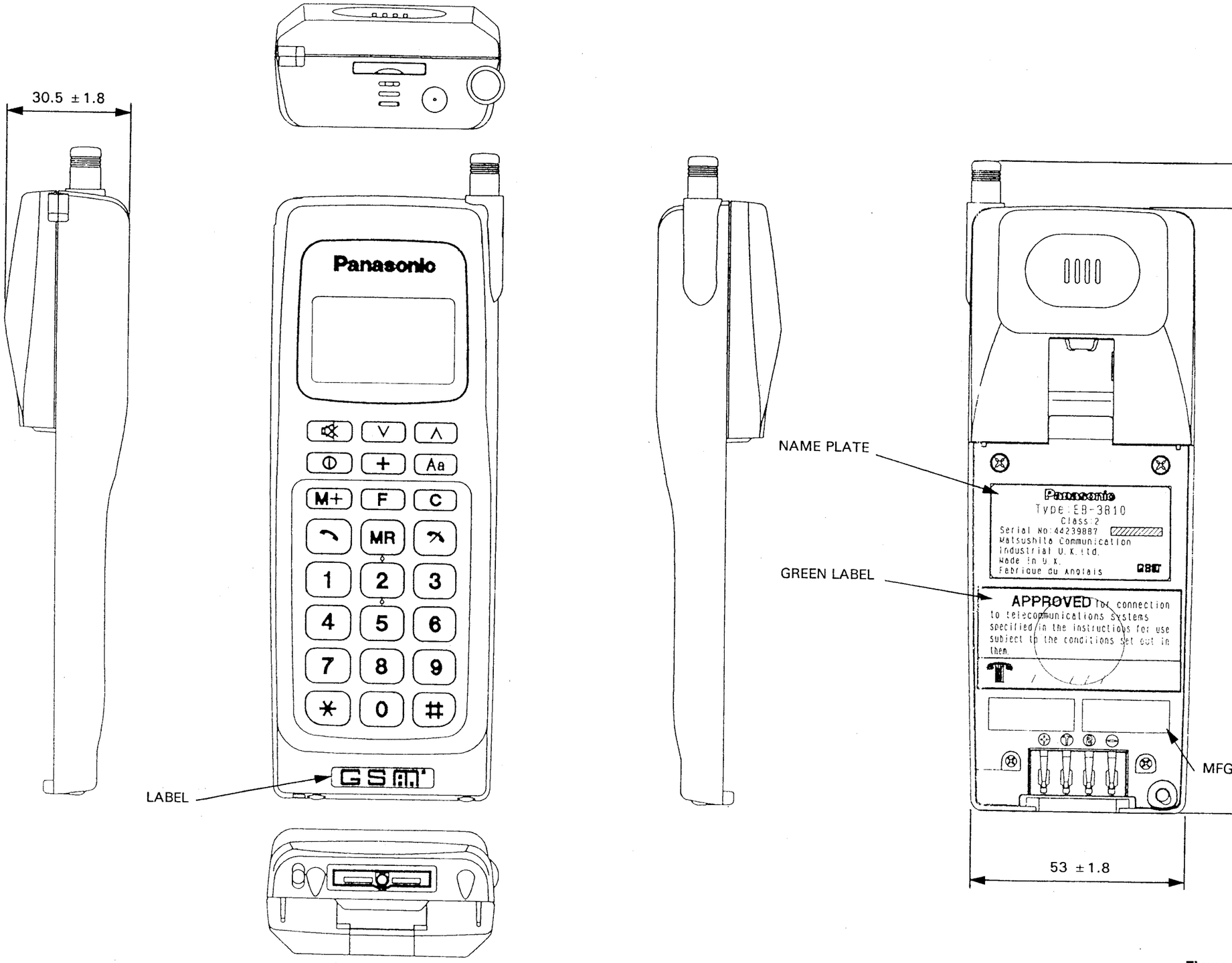
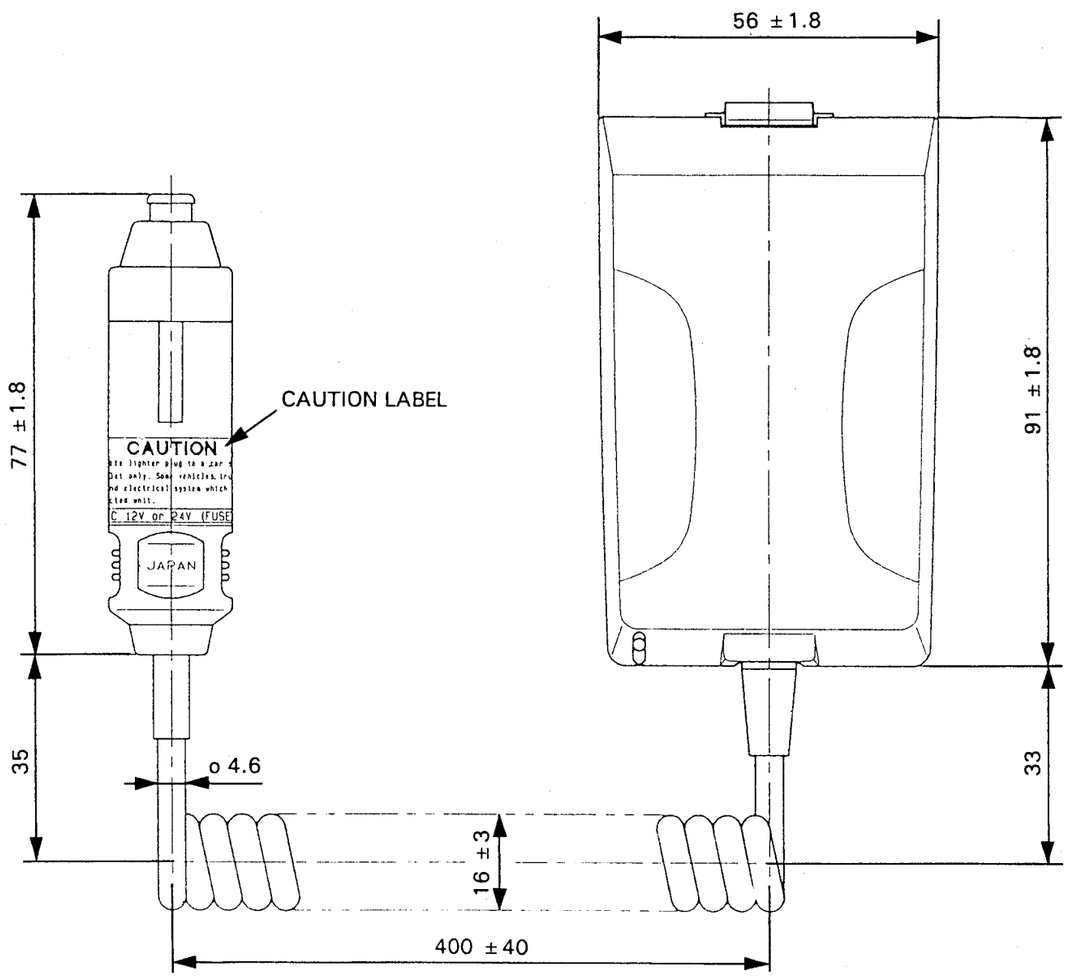



**Figure 6 Handportable Unit, EB-3810**




## CAUTION

Connect this cigarette lighter plug to a car standard 12V or 24V negative ground outlet only. Some vehicles trucks, etc... use a positive ground electrical system which will cause damage to the connected unit.

DC 12V or 24V (FUSE 1A)

DETAIL OF CAUTION LABEL

**Figure 9 DC Adaptor, EB-P10290**

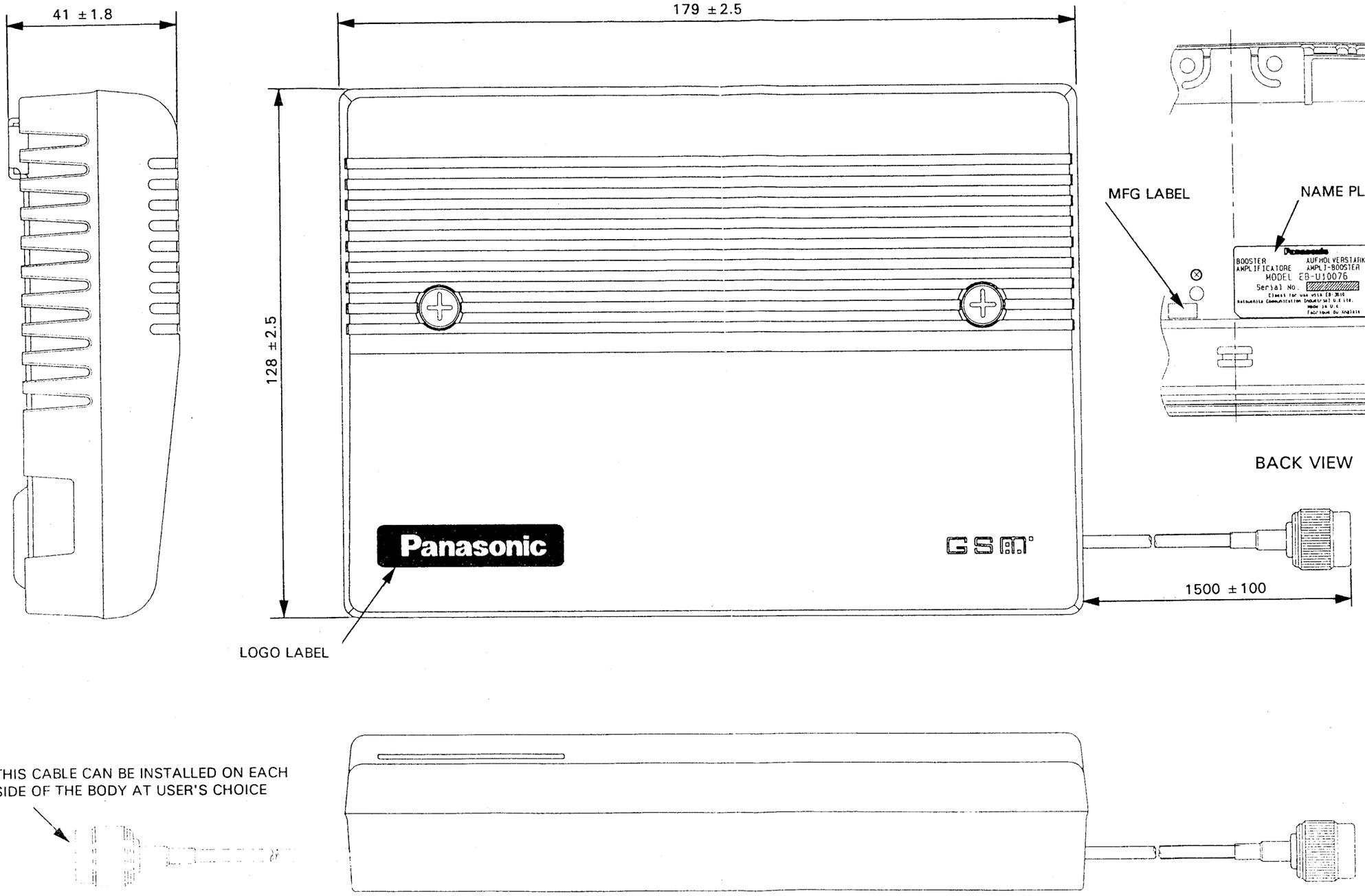
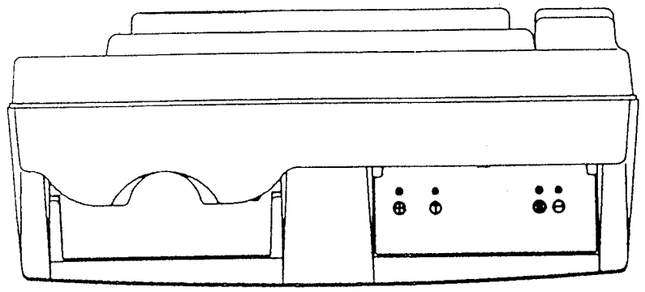
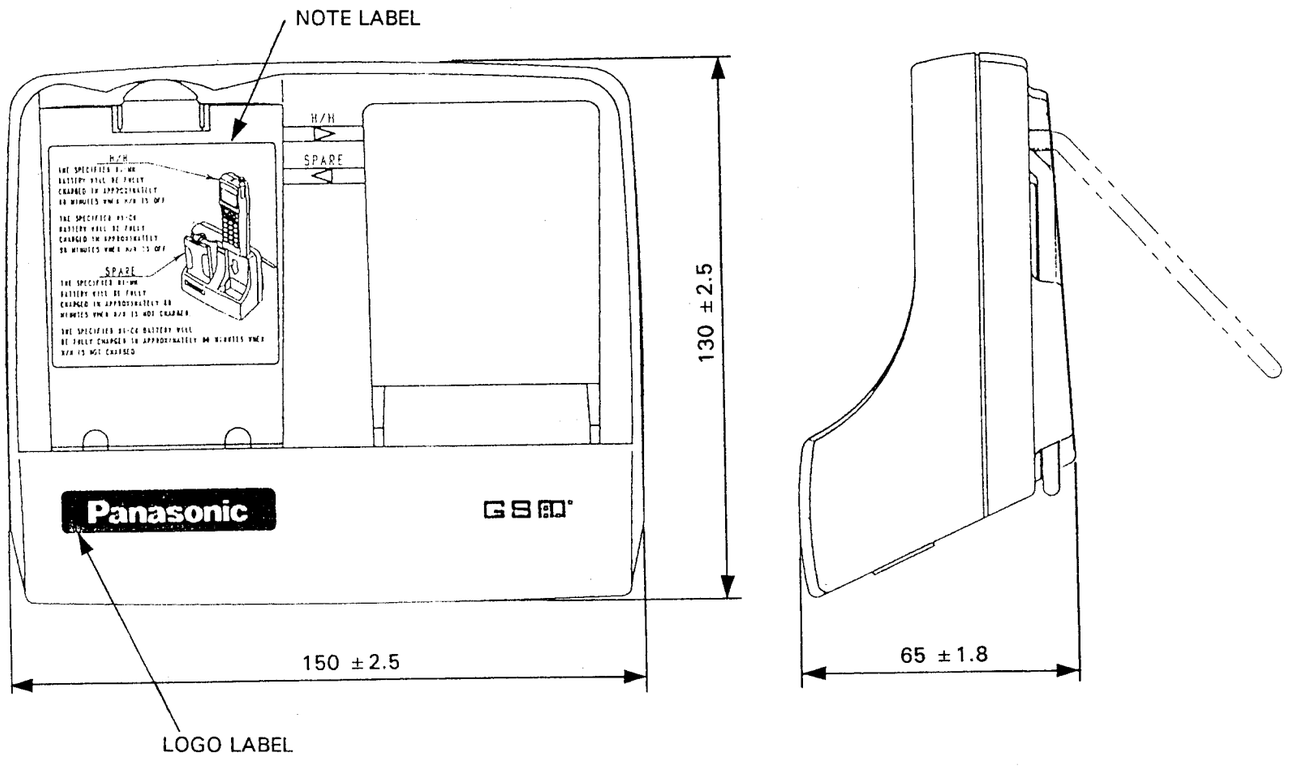



**Figure 8 Booster, EB-U10076**









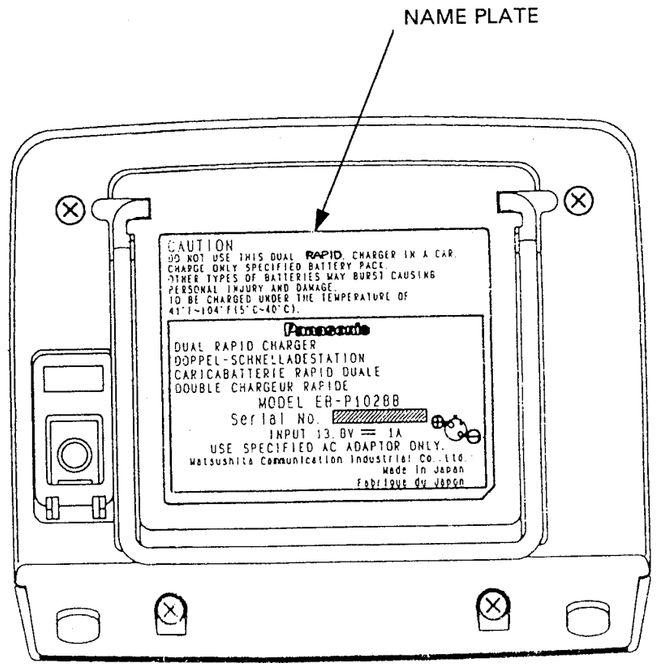
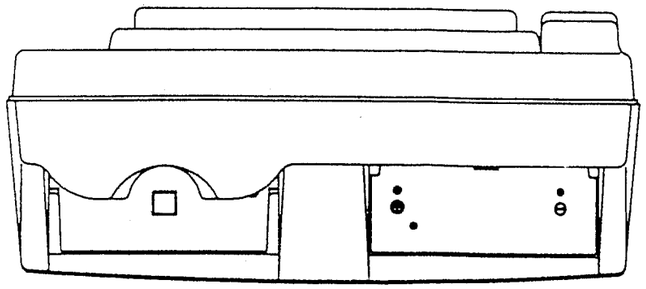
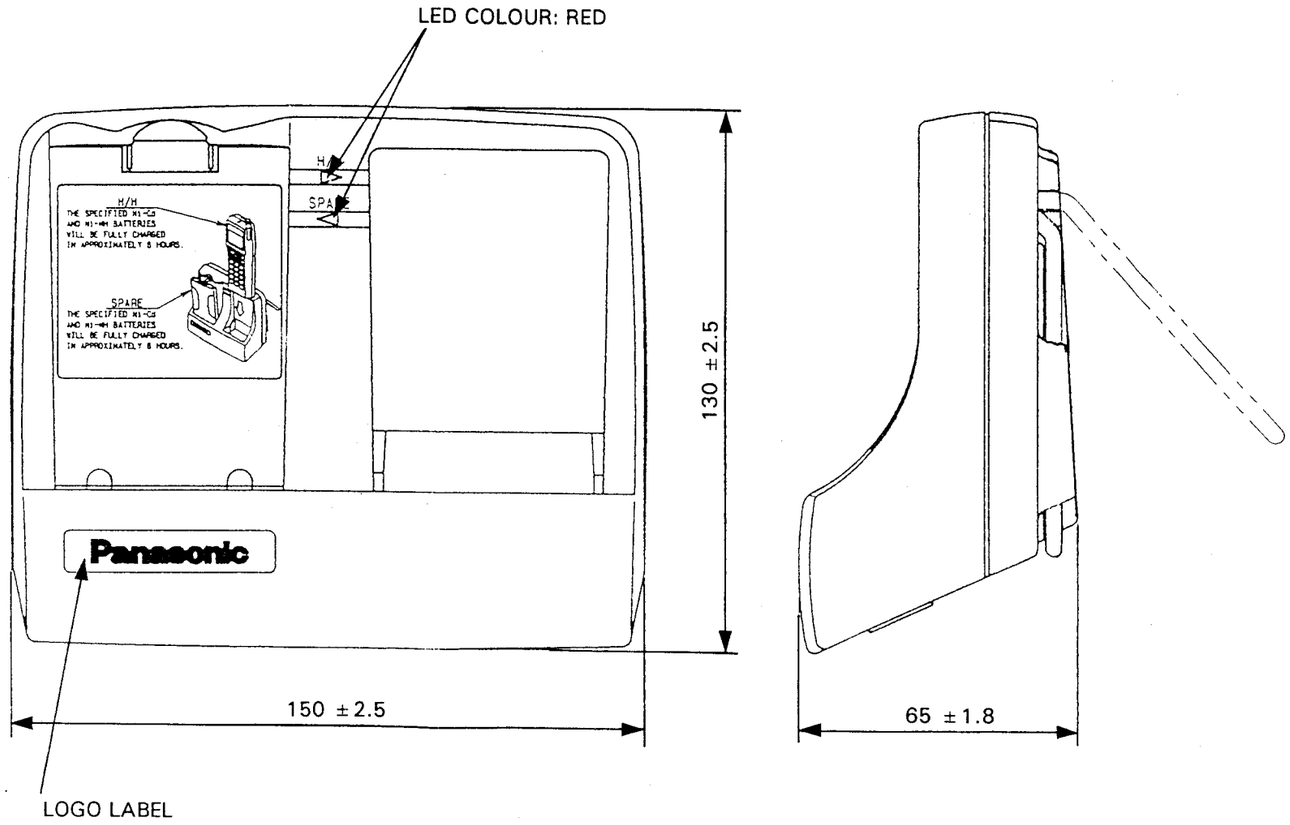



**Figure 11 Dual Rapid Charger, EB-P10288**





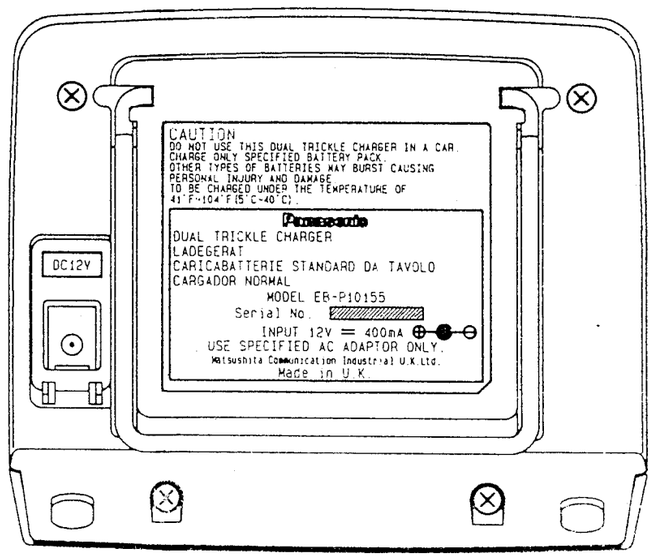




**Figure 10 Dual Trickle Charger, EB-P10155**

# 3. OPERATING INSTRUCTIONS

Refer to the enclosed operating instructions for information on how to operate and use your telephone.

# 4. INSTALLATION GUIDE

This section describes the procedures for installing the GSM HPU into a negative grounded vehicle.

**CAUTION: Do not install this equipment in, or attempt to power it from a positive grounded vehicle.**

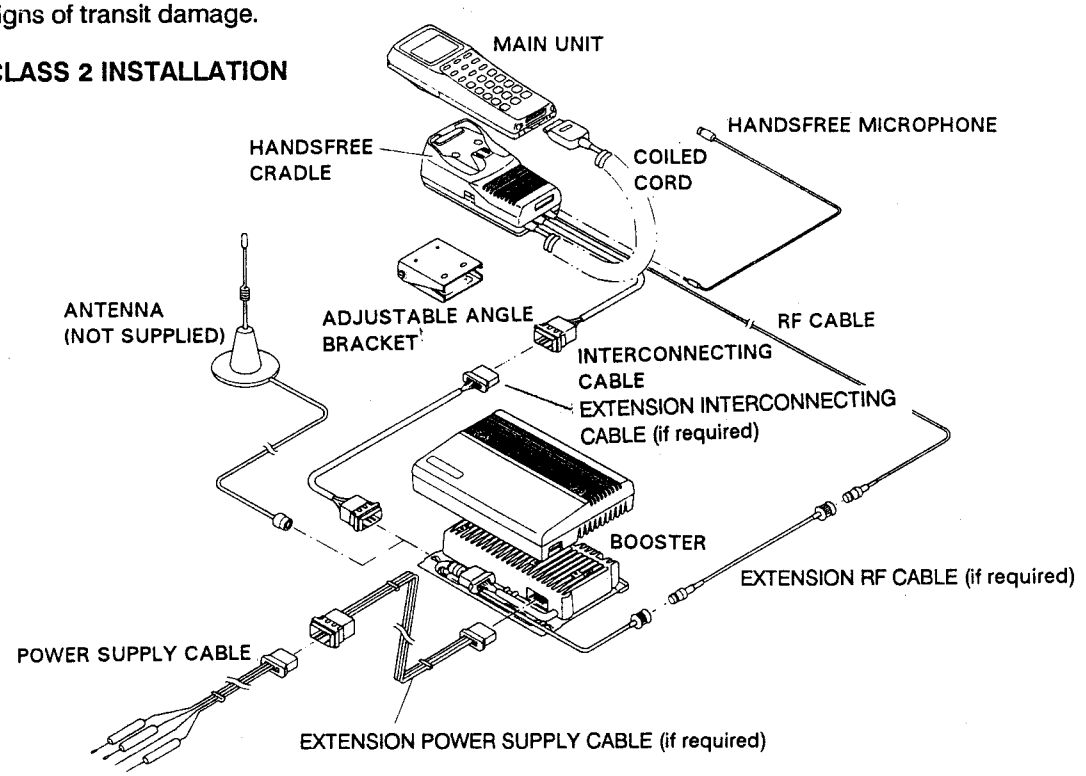
Installation will be either:

a) Class 2: using the handsfree car mount kit, Booster kit and in-boot installation kit,

b) Class 4: using the handsfree car mount kit only .

Before commencing installation, ensure that all necessary parts are present. Visually inspect each part for signs of transit damage.

## 4.1 CLASS 2 INSTALLATION




### 4.1.1 Selecting the Location for the Booster

The following factors should be considered when selecting an installation position for the booster:

- avoid direct exposure to sunlight, or any heat generating components within the vehicle.
- avoid exposure to moisture.
- avoid areas most likely to be damaged in the event of a collision with another vehicle.
- avoid affecting any vehicle functions.
- avoid any area that may be subject to damage due to people or items travelling/carried in the vehicle.
- ensure easy access for maintenance.

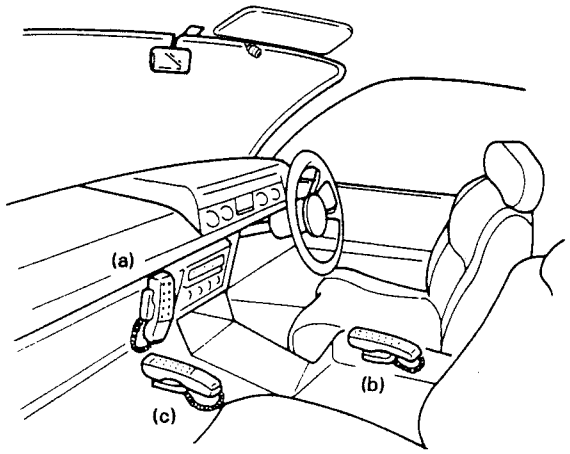
The recommended locations for the booster are the boot of a passenger car, and the cab area in a truck.

### 4.1.2 Selecting the Location for the Handsfree Cradle

The following points should be considered when choosing a location for the handsfree cradle.

- Ensure the location does not obstruct normal operation/functioning of the vehicle.
- Ensure the location does not affect passenger accommodation, or is subject to excessive shocks.
- Ensure that the location will allow easy operation of the unit.
- Ensure that the location provides a secure fixing for the unit.
- Avoid direct exposure to the sun's rays, or to rain.
- Ensure that the location takes due consideration of cable routing requirements.

Considering the points listed above, the recommended locations for mounting the handsfree cradle unit are the Dashboard, Arm rest storage compartment and the Centre console.




(a) Dashboard

(b) Arm rest storage compartment

(c) Centre console

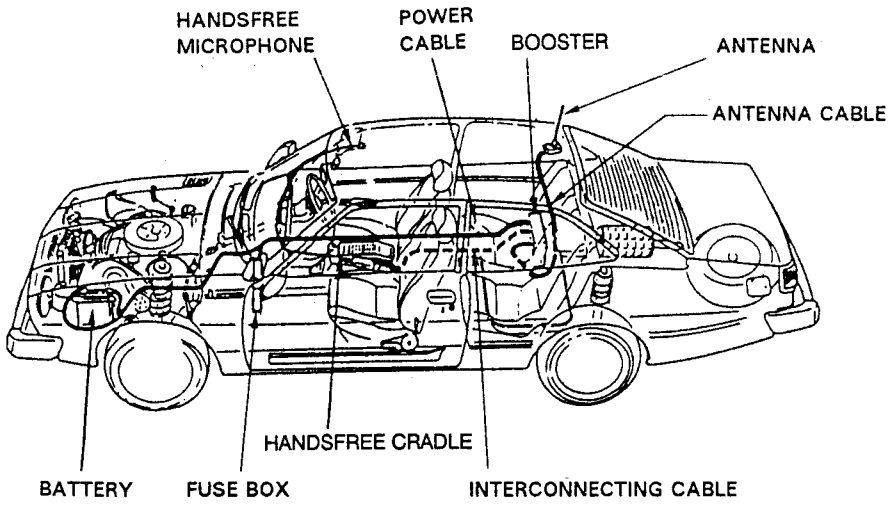
**Figure 4.1 Handsfree Cradle Unit Locations**

### 4.1.3 Wiring

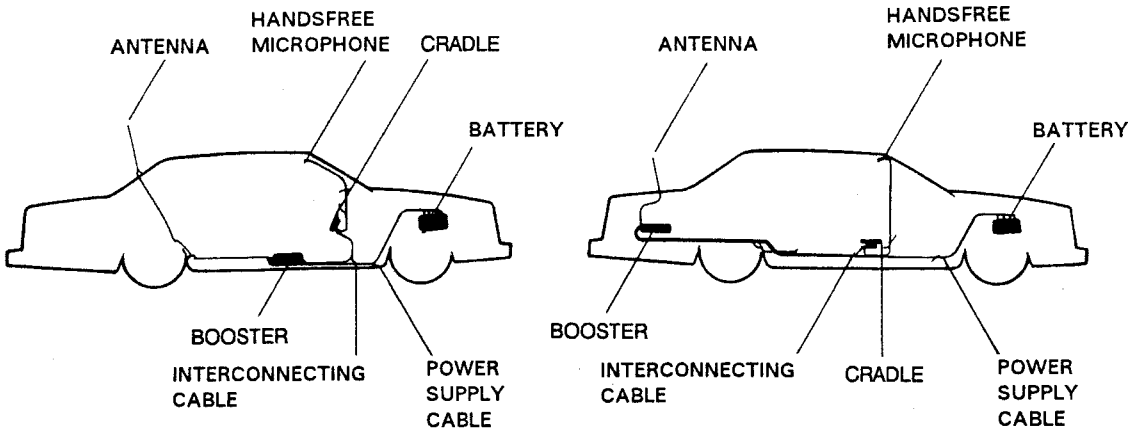
Locations for the booster and the handsfree cradle will vary according to the type of vehicle, as will the routing of power and interconnecting cables. Depending on the location of the booster, it may be necessary to use the extension cable kit, EB-KJ0249. The following precautions should be observed:

- Mount cables to the vehicle such that they are not prone to displacement or disconnection through vibration.
- Route cables through existing ducts/grooves in the vehicle floor, where possible.
- Route cables through existing holes in the dashboard, bulkheads etc., where possible.
- Site cables such that contact with moving parts (brake/clutch pedals, seat mechanisms etc) is avoided.
- Site cables as far away as possible from existing cabling, to avoid electrical induction.
- When connecting cables to the vehicle circuitry, ensure that the vehicle functions are not affected.

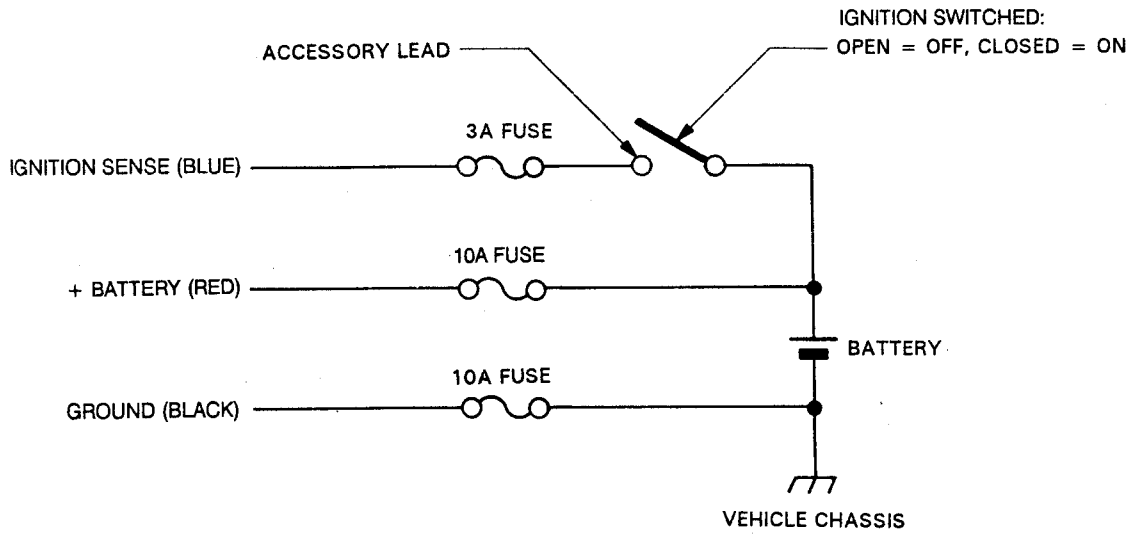
Typical car installations are illustrated below:




The actual location of units may vary according to the vehicle type. For optimum telephone use, the antenna (not supplied) should be placed in one of the locations shown below:



#### 4.1.3.1 Power cable (booster to battery)




(1) Disconnect the vehicle battery.

(2) Route the cable from the booster to the engine compartment using existing cable tracks and holes where possible.

(3) Ensure that the cable is protected within the engine compartment, for example using a corrugated tube with the end of the tube covered with vinyl tape. The fuse holder should be easily accessible.

#### 4.1.3.2 Interconnecting cable (booster to handsfree cradle)

The handsfree cradle is powered from the booster using the interconnecting cable.

#### 4.1.3.3 RF cable (booster to handsfree cradle)

The external antenna (not supplied) is connected directly to the booster. The RF cable is then installed between the booster and the handsfree cradle.

### 4.1.4 Installation of the Booster

Having selected the location for the booster and installed the wiring, the booster unit can now be installed.

#### 4.1.4.1 Marking the installation position

(1) Remove the upper housing of the booster by removing the two screws.

(2) Place the booster base in position and mark the four mounting hole positions.

(3) If the installation position is not flat, select higher (convex) areas for the mounting hole positions. Check that the locations selected for mounting holes have no obstructions behind them (i.e. pipes, fuel tanks etc).

#### 4.1.4.2 Drilling mounting holes

(1) Punch the hole positions marked for drilling.

(2) If the mounting plane is thin, bolts will be required for mounting the unit: drill 7mm holes. If the mounting plane is thick, screws can be used: drill 4mm holes.

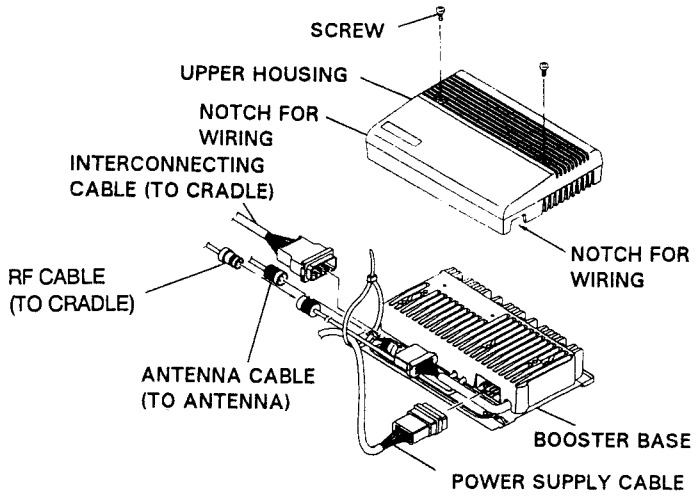
(3) Deburr the holes and apply rust inhibitor to the surface of the cut edges.

(4) Mount the booster base.

#### 4.1.4.3 Connection of cables

(1) Connect cables as shown in the diagram.

(2) Replace the upper housing onto the booster and replace the screws.




### 4.1.5 Installation of Handsfree Cradle

The handsfree cradle can be mounted either by:

Direct installation, using self tapping screws.

Installation with the adjustable angle bracket.

#### 4.1.5.1 Direct installation

(1) Remove the M3 screw and separate the case from the cover.

(2) Disconnect the speaker and charging connectors.

(3) Place the case on the installation position and mark the two mounting hole positions.

(4) The diameter of the holes may be varied, depending on the material and plate thickness at the mounting locations. If the mounting location is hard plastic, drill a 2mm hole at each of the marked mounting locations and mount the case using two M4 self tapping screws.

(5) Reconnect the speaker and charging connectors. Reassemble the case and screw together.

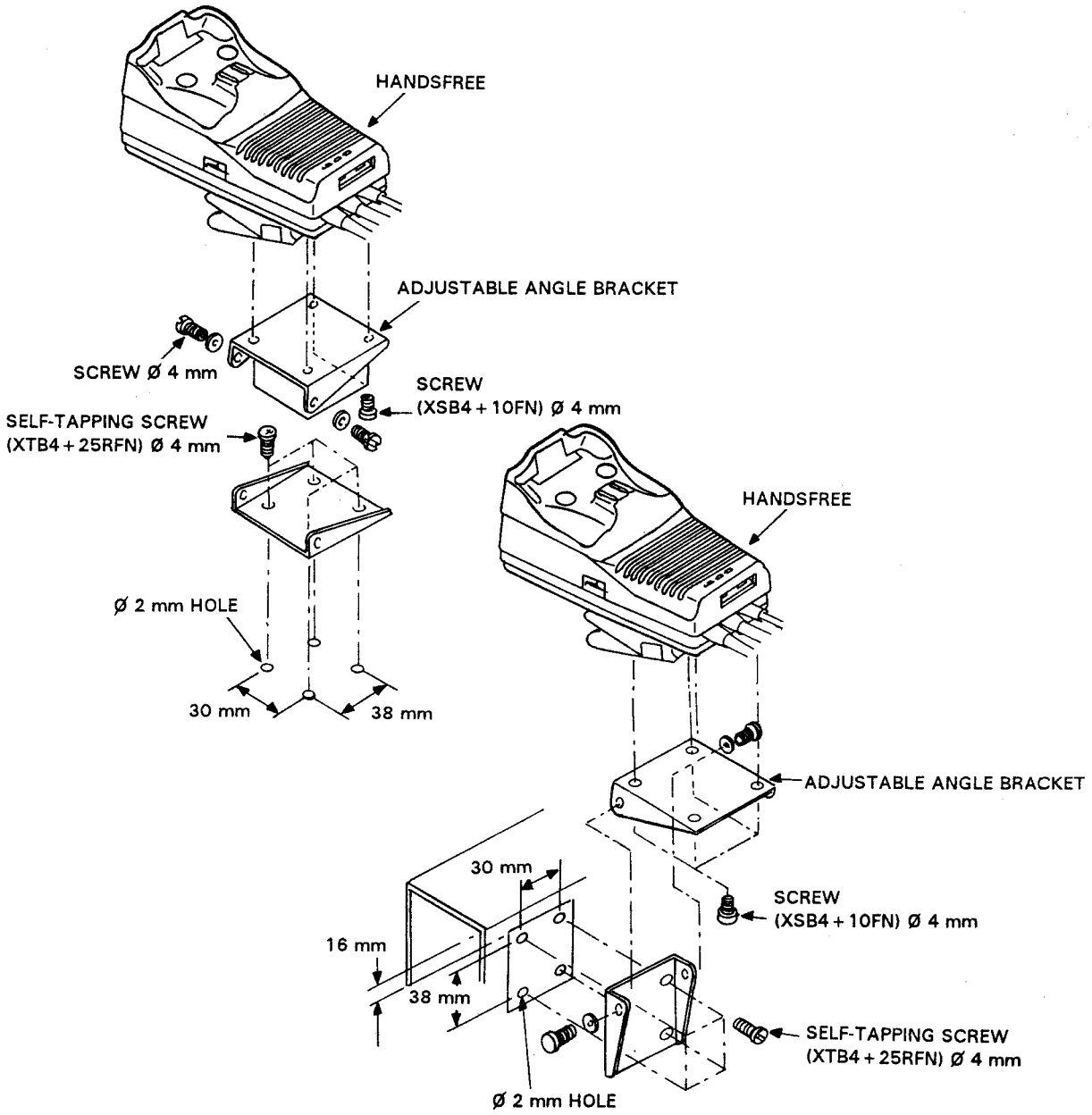
### 4.1.5.2 Installation with the adjustable angle bracket

(1) Place the adjustable angle bracket in position and mark the 4 mounting hole locations.

(2) The diameter of the holes may be varied, depending on the material and plate thickness at the mounting locations. If the mounting location is hard plastic, drill a 2mm hole at each of the marked mounting locations and mount the bracket using four M4 self tapping screws.

(3) Mount the handsfree cradle onto the adjustable angle bracket using four M4 screws.

CAUTION: If screws other than those provided with the adjustable angle bracket are used, the base bottom to the screw end must be between 7mm and 9mm.




(4) To connect the telephone to the cradle, remove the connector cap from the base of the telephone. Place the handportable unit onto the handsfree cradle and plug the coiled cord from the cradle into the telephone connector socket. To remove the cradle plug, press the lock button and pull it away from the telephone connector.

### 4.1.6 Installing the Handsfree Microphone

The following points should be considered when installing the handsfree microphone:

- It does not obstruct the operation of the vehicle.
- It does not affect the normal passenger accommodation.
- The microphone should face the drivers mouth.

#### 4.1.6.1 Mounting the microphone to the sun visor

(1) Mount the microphone onto the sunvisor clip by inserting the projection of the clip into the hole of the microphone base.

(2) Mount the microphone onto the sunvisor as shown in the diagram.

(3) Connect the handsfree microphone to the handsfree cradle.

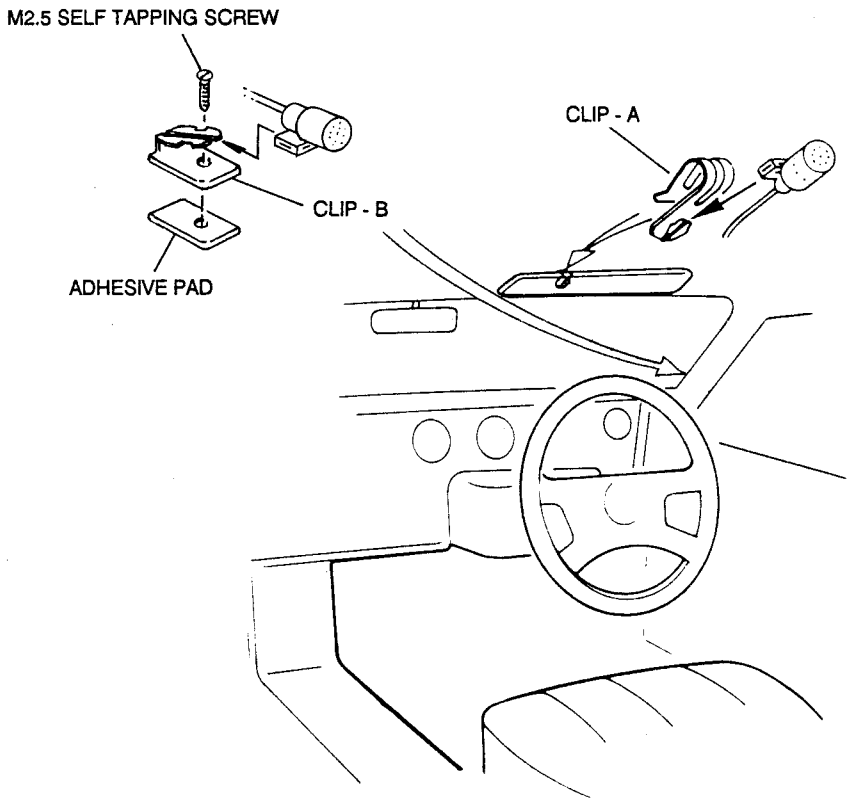
#### 4.1.6.2 Mounting the microphone the dashboard

(1) Attach the adhesive pad to the dash board clip.

(2) Drill a 1mm hole at the mounting location and mount the clip using a M2.5 self tapping screw.

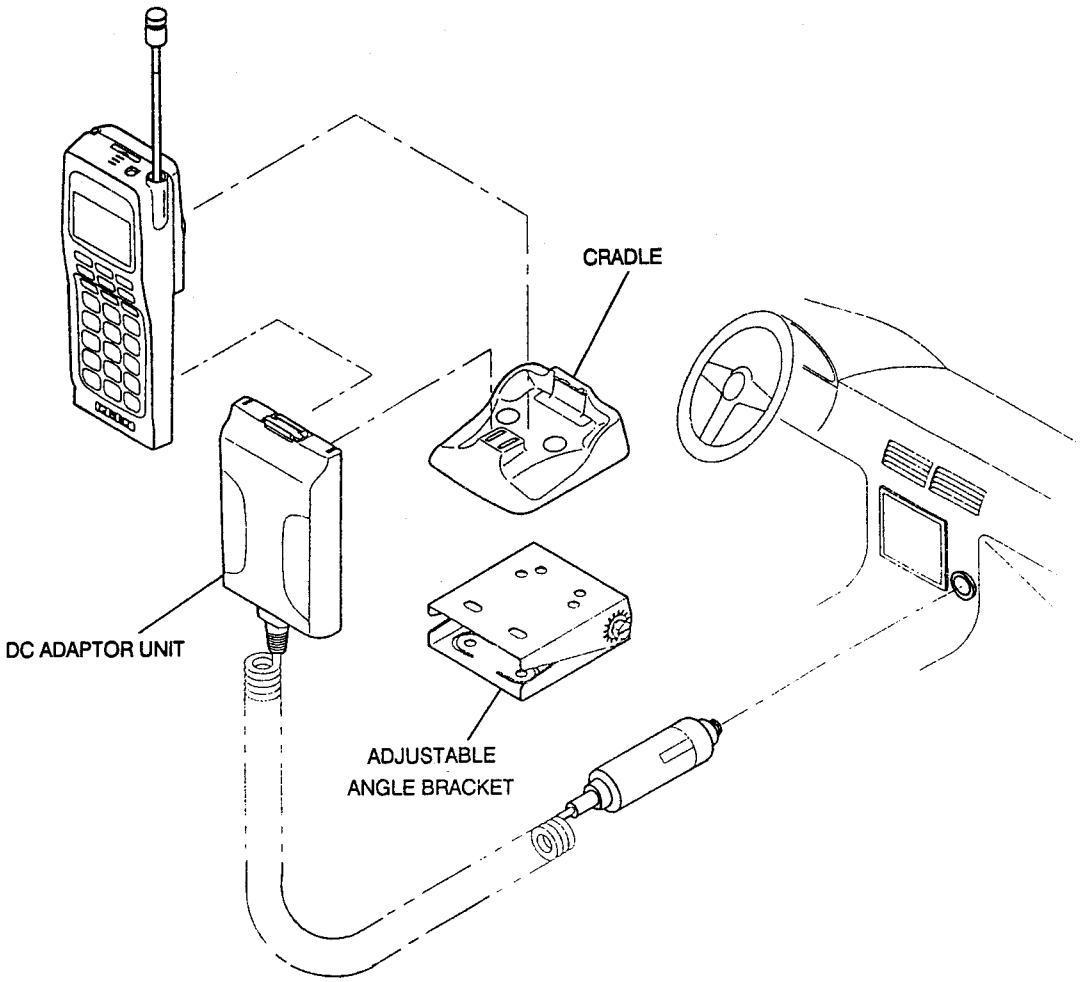
(3) Insert the projection of the clip into the microphone base, ensuring that it points towards the driver mouth.

(4) Connect the handsfree microphone to the handsfree cradle.



## 4.2 CLASS 4 INSTALLATION USING DC ADAPTOR KIT

Refer to section 4.1.5 for before mounting the cradle. The telephone is powered directly from the 12V cigar lighter socket. Switch telephone power off, and replace the battery with the DC adaptor.



# 5. DISASSEMBLY/REASSEMBLY INSTRUCTIONS

This section provides disassembly and reassembly instructions for the main components of the EU2000 series.

The warnings and precautions stated on page v of the preliminary pages must be observed during all disassembly/reassembly operations.

It is important to follow all instructions carefully in order to avoid damage to the units.

## 5.1 HAND PORTABLE UNIT

### Disassembly Instructions

This section covers disassembly instructions for the following:

Removal of the Main Board from the Casing
Removal of the SIM Unit from the Main Board
Disassembly of the SIM Unit
Disassembly of the Keypad
Disassembly of the Display
Disassembly of the Main Board

### Removal of the Main Board from the Casing

(1) Remove the access cover of the battery pack from the base of the unit (refer to Figure 5.1.1).

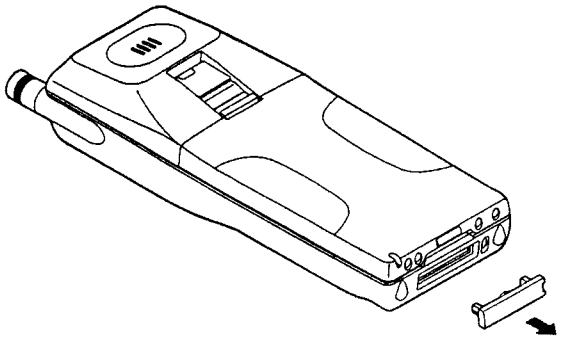


**Figure 5.1.1**

(2) Remove the battery pack from the back of the telephone (refer to Figure 5.1.2).

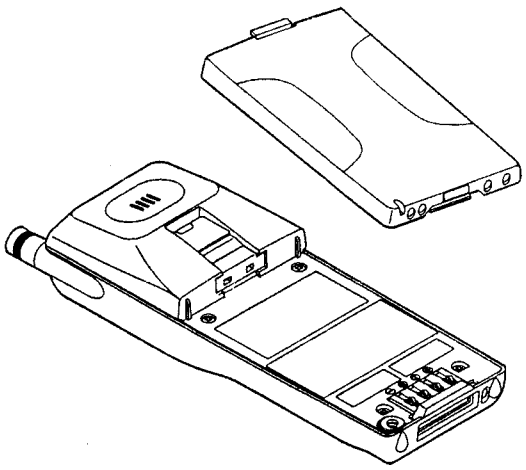


**Figure 5.1.2**

(3) Remove four screws from the back of the unit (the screws were originally concealed by the battery). The back of the case can now be removed (refer to Figure 5.1.3).

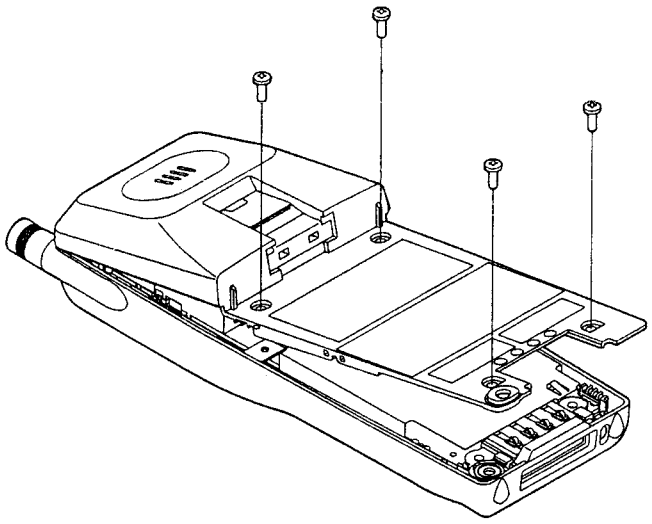


**Figure 5.1.3**

(4) Remove the metal clip located centrally in the unit. Raise the antenna and desolder the coil connecting the antenna to the main board (the coil is located in the top left of the telephone case) (refer to Figure 5.1.4).

Note: To avoid damage it is advisable that the buzzer, LS2, is removed from its location at the top of the board and desoldered.

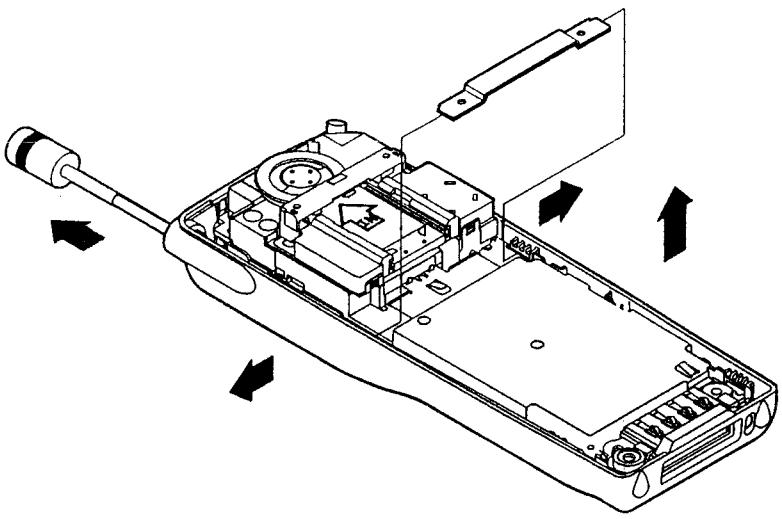


**Figure 5.1.4**

(5) The main board including the display and SIM card reader can now be removed in one piece by gently easing the main board out of the outer casing (refer to Figure 5.1.5).

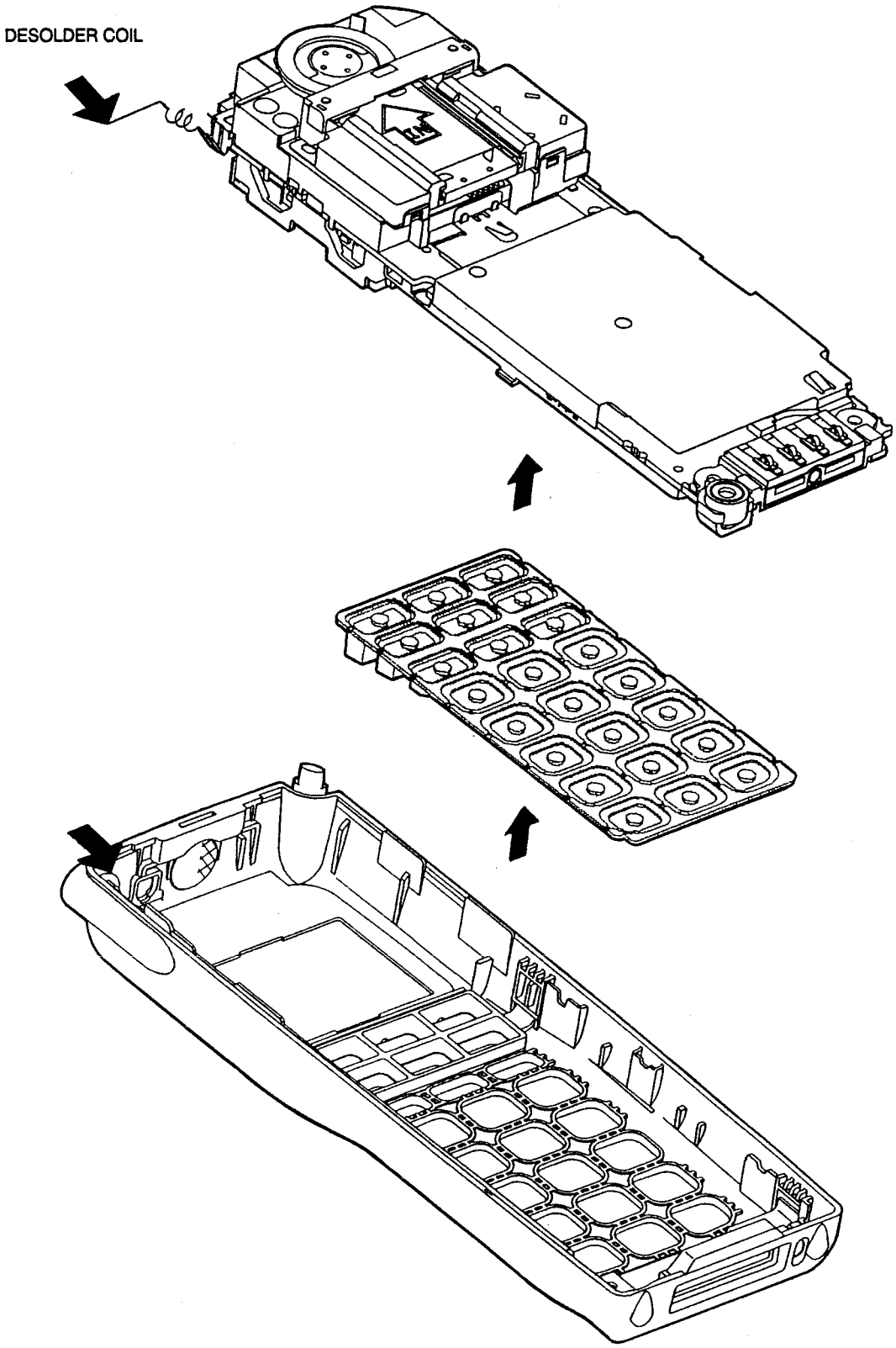



**Figure 5.1.5**

(6) The logic shield on the back of the unit needs five points to be desoldered before it can be removed. These points can be located (refer to Figure 5.1.6):

a) Copper shielded wire to the bottom left of the board.

b) Two connections close to the SIM card entrance.

Note: Care should be taken not to damage the flexible connector and SIM unit which are both in close proximity.

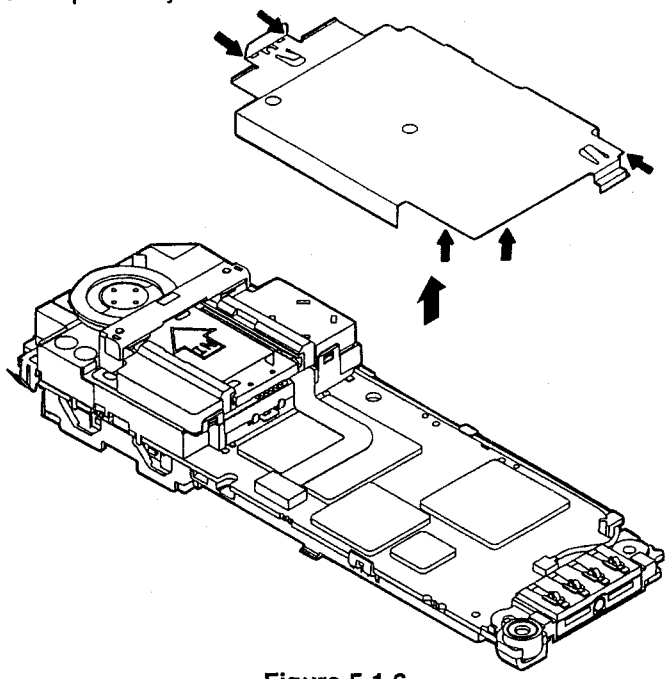


**Figure 5.1.6**

**Removal of the RF Shield and SIM Unit from the Main Board**

(7) Disconnect the flexible strip connector by pushing the clips on the side of the holding socket towards the centre of the board (refer to Figure 5.1.7). Desolder the RF shield at the points indicated.

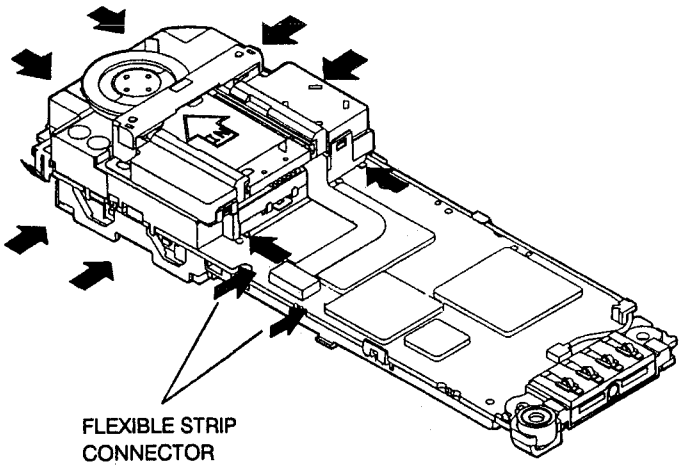



**Figure 5.1.7**

(8) The RF shield and SIM unit can now be removed by easing the whole unit upwards. The two boards which were originally hidden by the Sim unit can also be removed, the smaller L shaped board can just be lifted from its socket. The larger rectangular board needs an additional wire removing before it can be lifted from its socket (refer to Figure 5.1.8).

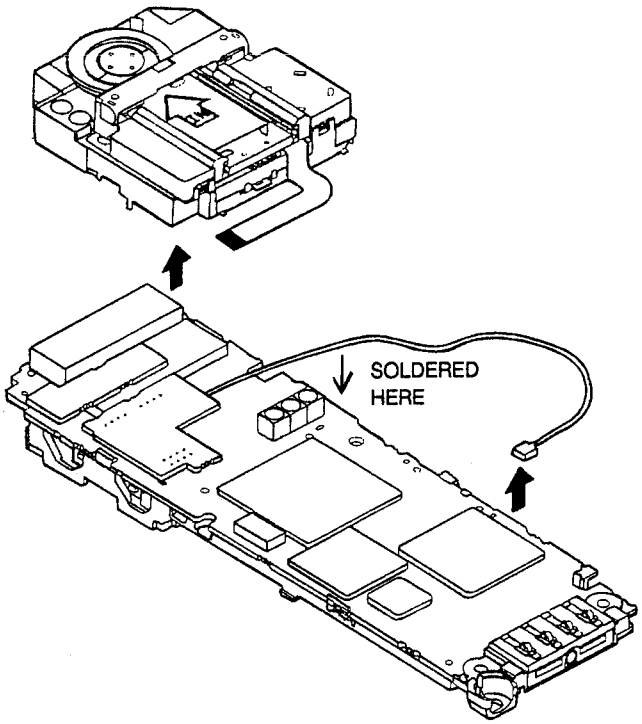



**Figure 5.1.8**

**Disassembly of the SIM Unit**

(9) Remove the shielding (the speaker on top of the SIM unit does not need to be removed from the shielding). The wires to the speaker can be removed by desoldering them from the speaker (refer to Figure 5.1.9).

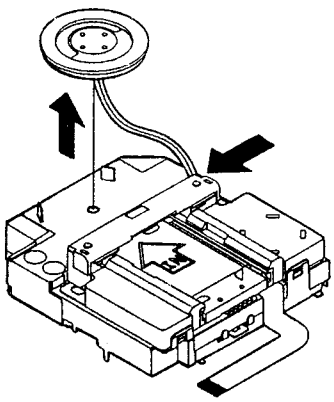


**Figure 5.1.9**

(10) Check that the SIM card holder has been removed from the unit (if it is still present remove it) (refer to Figure 5.1.10).

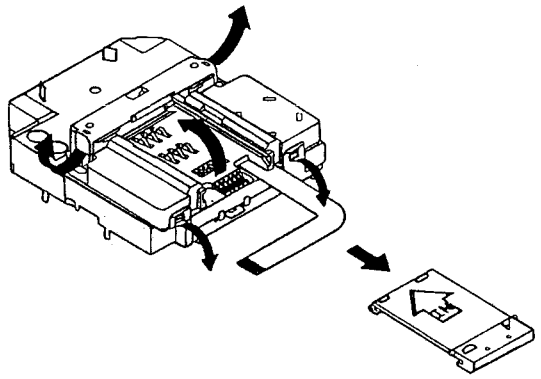


**Figure 5.1.10**

(11) Unclip the metal clips located at the base of the RF shield (either side of the SIM card entrance slot) and lift the SIM card unit off the top of the RF shield (refer to Figure 5.1.11).

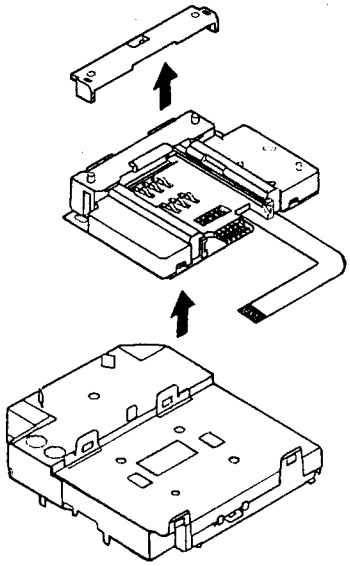


**Figure 5.1.11**

(12) Lift the SIM card location surround from the base of the SIM unit base (refer to Figure 5.1.12).

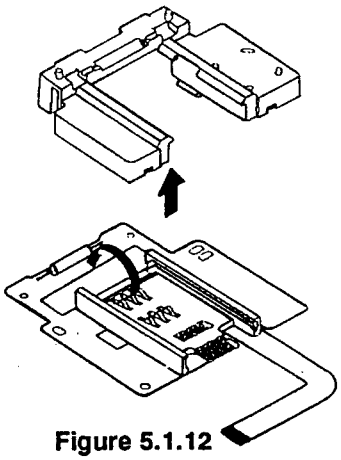


**Figure 5.1.12**

**Disassembly of the Keypad**

(13) Position the unit with the display screen visible and to the top. On the left hand side of the unit is a clip which secures the keypad to the unit, remove the two screws that secure the clip (refer to Figure 5.1.13).

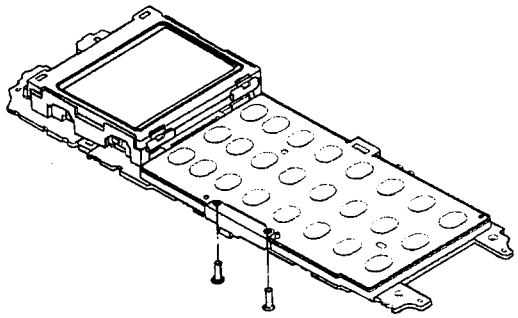


**Figure 5.1.13**

(14) Slide the clip off (towards the left), be careful not to loose the 'zebra' strip located here (refer to Figure 5.1.14).

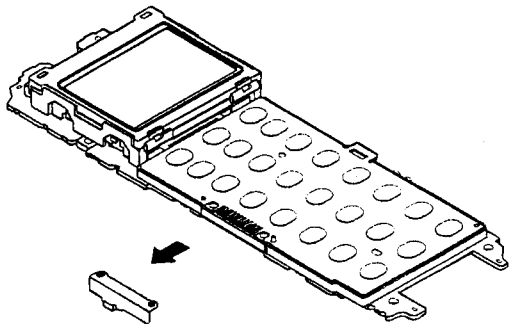


**Figure 5.1.14**

(15) Unclip the keypad on the right hand side, the keypad can now be lifted up and away from the base (refer to Figure 5.1.15)

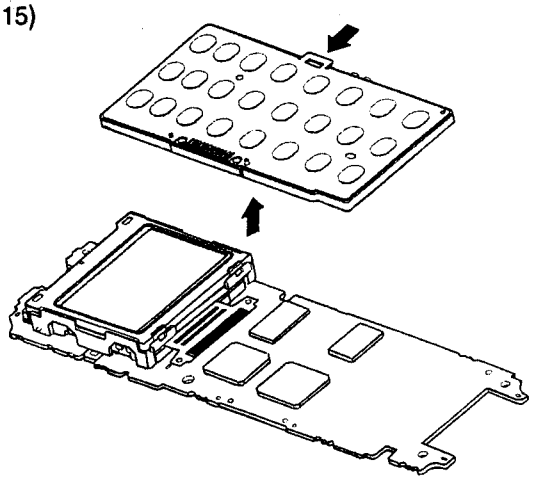


**Figure 5.1.15**

(16) The keypad consists of three sections which can be separated by easing the sections apart (refer to Figure 5.1.16).

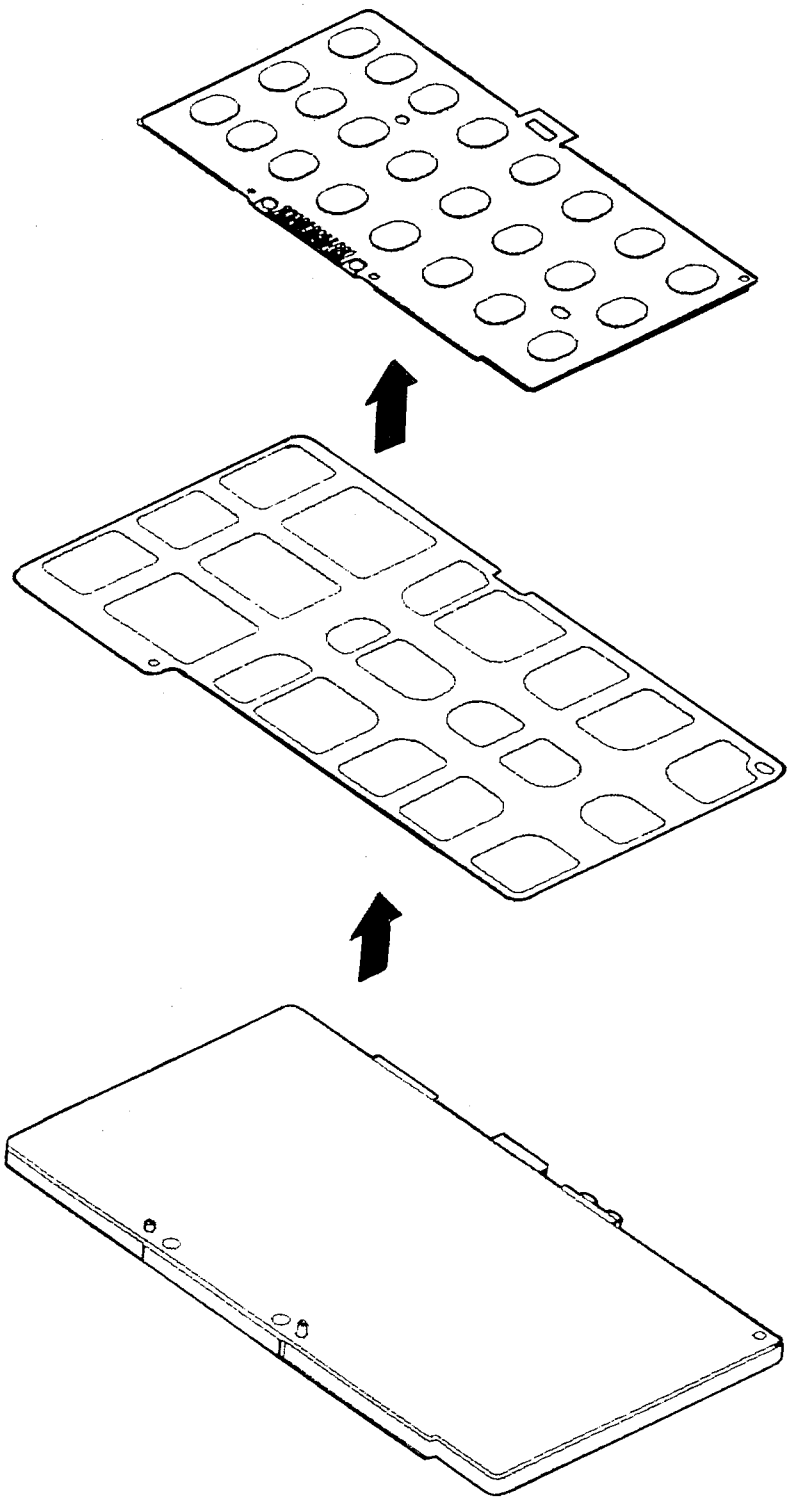


**Figure 5.1.16**

**Disassembly of the Display**

(17) A number of points need desoldering before the display can be disassembled. A pair can be found on the left and the right of the display, the remainder are located on the end of the flexible ribbon connecting the bottom of the display to the main board (26 connections). All need to be desoldered before the display can be removed (refer to Figure 5.1.17).

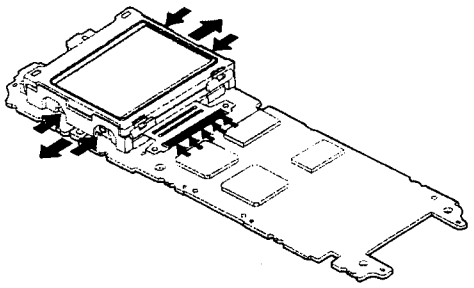


**Figure 5.1.17**

(18) After the points have been desoldered the plastic retaining clip located over the display can be removed. Unclip the clips located to the left and right of the display and lift off, to avoid damage the rubber gasket below should also be removed (refer to Figure 5.1.18).

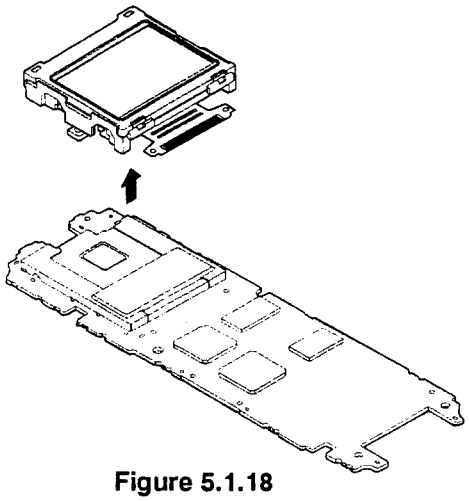


**Figure 5.1.18**

(19) The surround of the display can now be lifted from the LCD display (refer to Figure 5.1.19).

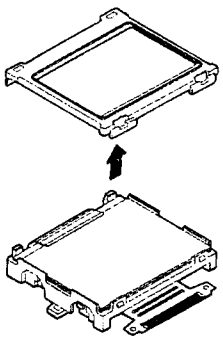


**Figure 5.1.19**

**Disassembly of the Main Board**

(20) Lift the display LCD to reveal another shield (refer to Figure 5.1.20). The shielding can be removed by desoldering five points located at:

a) Two on the left and two on the right of the shield.

b) One at the top left corner of the shield.

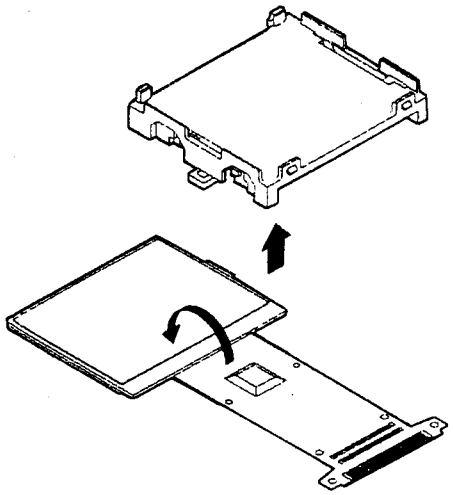


**Figure 5.1.20**

(21) After the points have been desolder lift the shielding away from the base (refer to Figure 5.1.21).

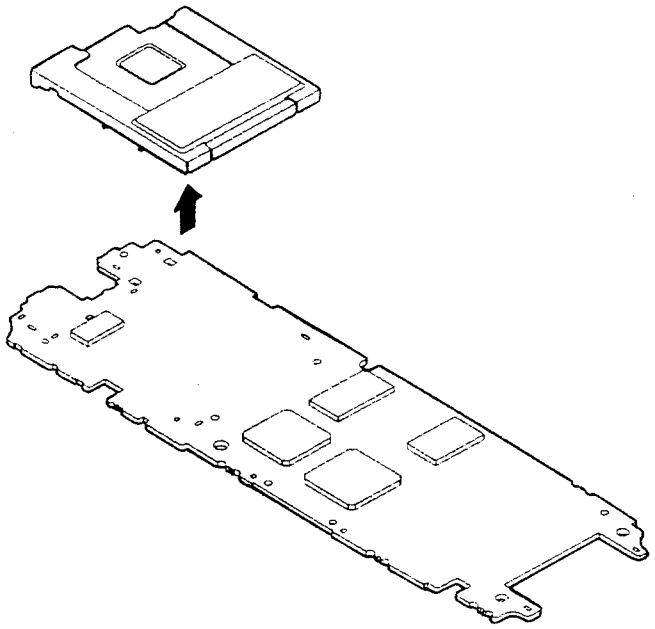


**Figure 5.1.21**

## 5.2 ASSEMBLY INSTRUCTIONS

This section covers reassembly instructions for the following:

Assembly of the Main Board
Connection of the Display
Assembly of the Keypad
Assembly of the SIM Unit
Connection of Shield and SIM Unit to the Main Board
Placing the Assembled Unit into the Casing

This is the recommended order of reassembly, for a unit that has been completely disassembled.

**Assembly of the Main Board**

(1) Replace the RF shield, locate under the display (refer to Figure 5.2.1). Five points require resoldering these are located at:

a) Two on the left and two on the right of the shield.

b) One at the top left hand corner of the shield.

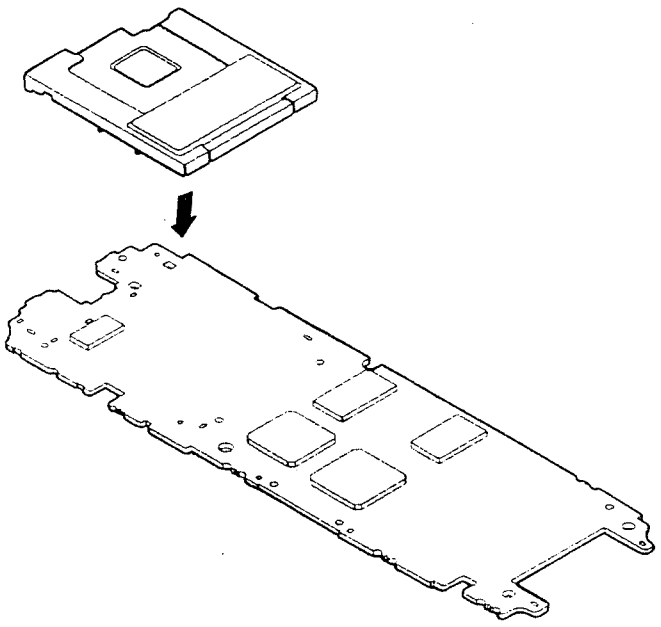


**Figure 5.2.1**

(2) Replace the plastic display backing, fold the display over on top of the backing (refer to Figure 5.2.2).

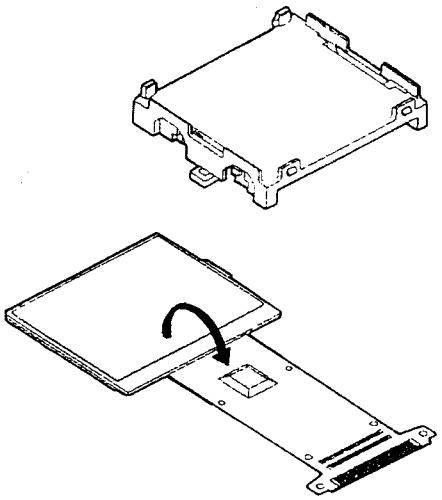


**Figure 5.2.2**

(3) Position the rubber gasket over the LCD display. Secure the plastic covering clip carefully over the top (refer to Figure 5.2.3)

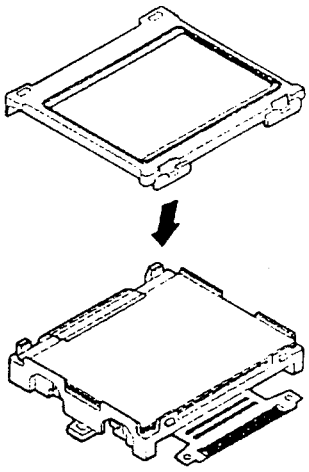


**Figure 5.2.3**

**Connection of the Display**

(4) A number of points need resoldering before the display will function correctly (refer to Figure 5.2.4).

a) Two can be found on the left and two on the right hand side of the display.

**Caution: Take care to avoid causing a short circuit.**

b) The remainder are located on the end of the flexible ribbon cable connecting the bottom of the display to the main board (26 connections).

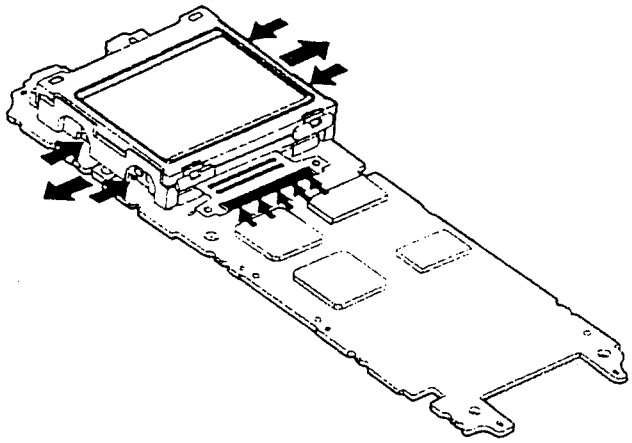


**Figure 5.2.4**

**Assembly of the Keypad**

(5) The keypad consists of three sections, these should be reassembled before being reconnectedto the main board. Ensure the opaque plastic sheet is to the bottom of the three, then the white template and then the keypad circuit (refer to Figure 5.2.5).

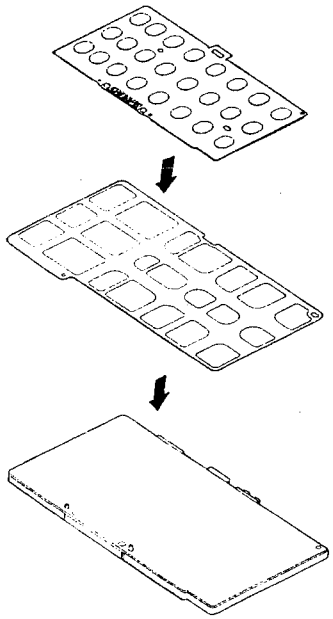


**Figure 5.2.5**

(6) Place the keypad assembly onto the main board ensuring it is correctly positioned on the locating pins, make sure the antenna cable is outside the location pins of the keypad (if necessary the cable should be disconnected and reconnected once the keyboard assembly has been relocated on the main board) (refer to Figure 5.2.6).

Note: Make sure the 'zebra' strip is located in position on the left of the keypad. Failure to replace this in its correct position will render the keypad inoperable.

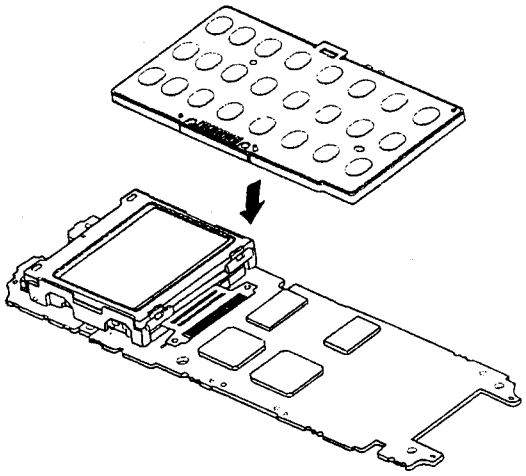


**Figure 5.2.6**

(7) Position the securing clip over the 'zebra' clip and secure with two screws (refer to Figures 5.2.7 and 5.2.8). If the antenna coil and LS2 buzzer were removed during disassembly they should now be reconnected.

Note: Reconnect the coil to the bottom of the inductor which is located at the top left of the main board (this links the inductor to the adjoining pad).

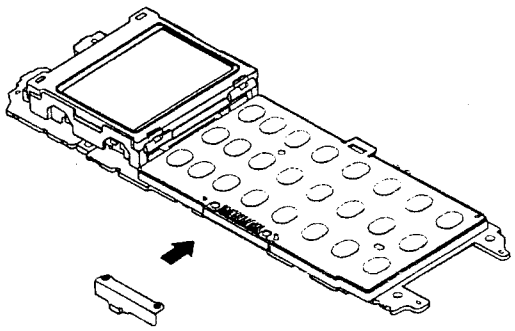


**Figure 5.2.7**

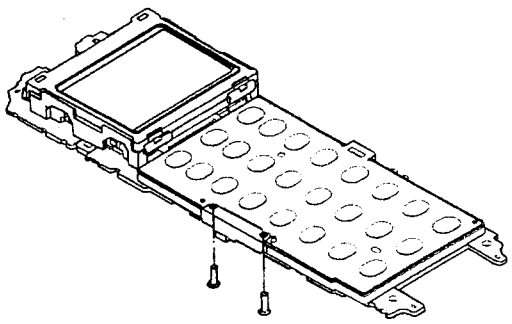


**Figure 5.2.8**

**Assembly of the SIM Unit**

(8) Replace the SIM card location surround onto the base of the SIM card unit (refer to Figure 5.2.9).

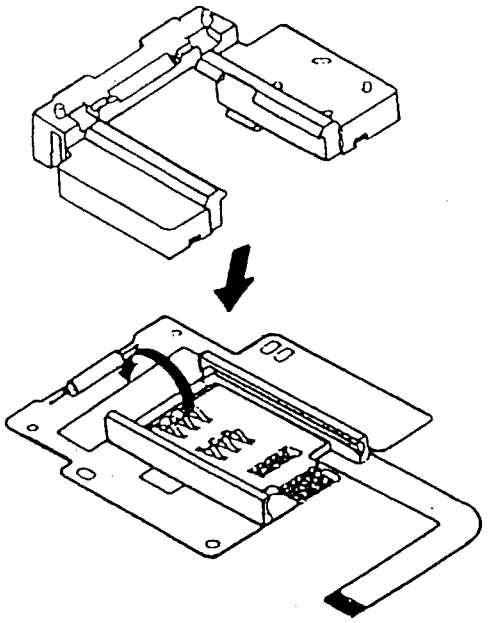


**Figure 5.2.9**

(9) Clip the SIM card unit onto the RF shield (refer to Figure 5.2.10).

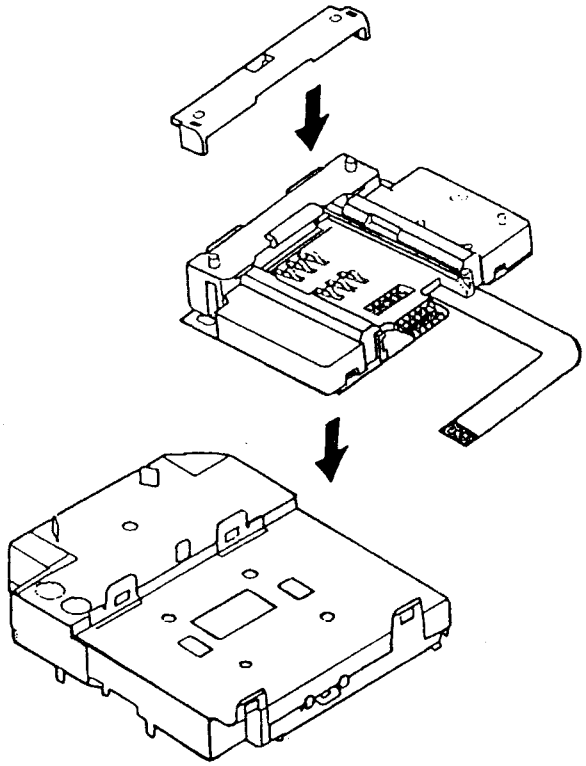


**Figure 5.2.10**

**Connection of the Shield and SIM Unit to the Main Board**

If the two daughter boards were removed during disassembly they should now be reassembled. Make sure they are pushed firmly back into their sockets and the larger board has its flying lead reconnected.

(10) Replace the RF shield and the SIM unit and make sure they are positioned correctly (refer to Figure 5.2.11). There are eight points that need to be resoldered, they are located:

a) Two on the left and two on the right hand side of the shield.

b) Two on the top and two on the bottom side of the shield.

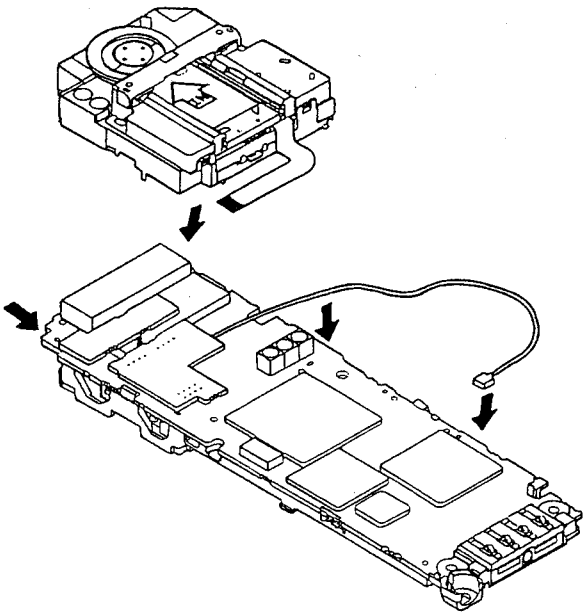


**Figure 5.2.11**

(11) Resolder the speaker wires to the speaker socket and reinsert the flexible connector into its socket on the left hand side of the board (refer to Figure 5.2.12).

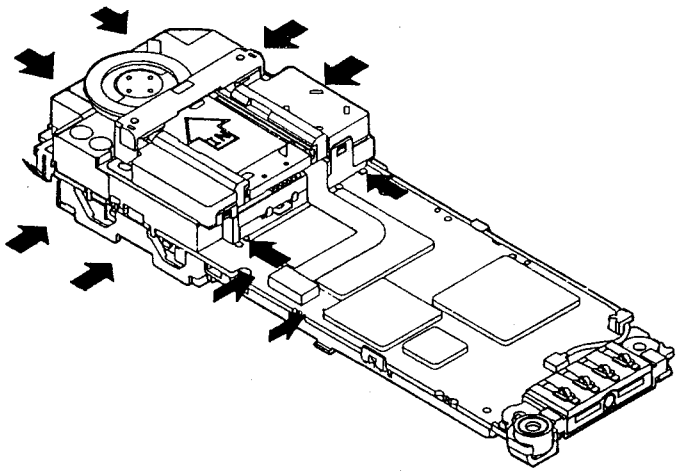


**Figure 5.2.12**

**Placing the Assembled Unit into the Casing**

(12) Locate the logic shield over the two clips at the bottom of the RF shield (refer to Figure 5.2.13). Five points need resoldering, they are located:

a) The copper shielded wire at the bottom left of the board - ensure the copper foil is wrapped firmly around the main board and logic shield, secure the wire firmly to the board.

b) Two connections close to the SIM card entrance. Make sure there is no damage to the flexible connector and the SIM unit.

c) Two connections at the base of the logic shield to the right of the shielded wire.

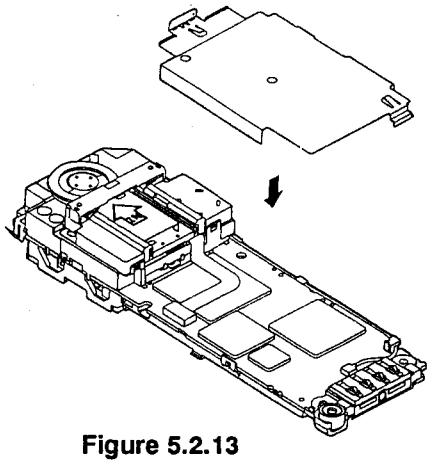


**Figure 5.2.13**

(13) The main board with display and SIM card reader can be replaced by gently easing it back into the casing. Make sure it is located correctly under the clips at the top and bottom of the casing (refer to Figure 5.2.14).

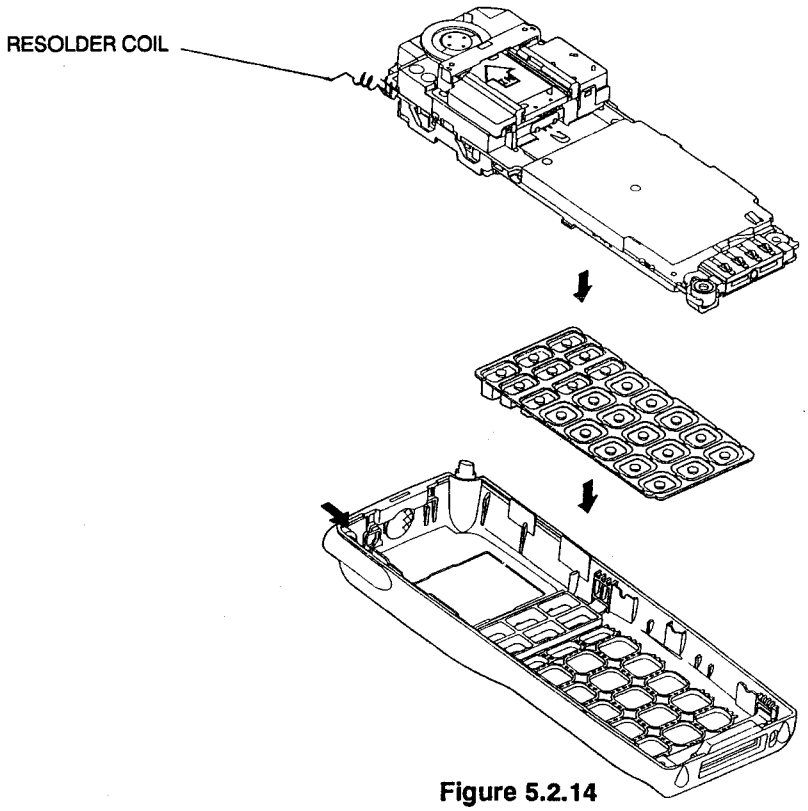



**Figure 5.2.14**

(14) Replace the metal clip which secures the board centrally in the unit and make sure it is fixed firmly (refer to Figure 5.2.15). Resolder the antenna to the main board (make sure the soldering iron does not come into contact with the casing).

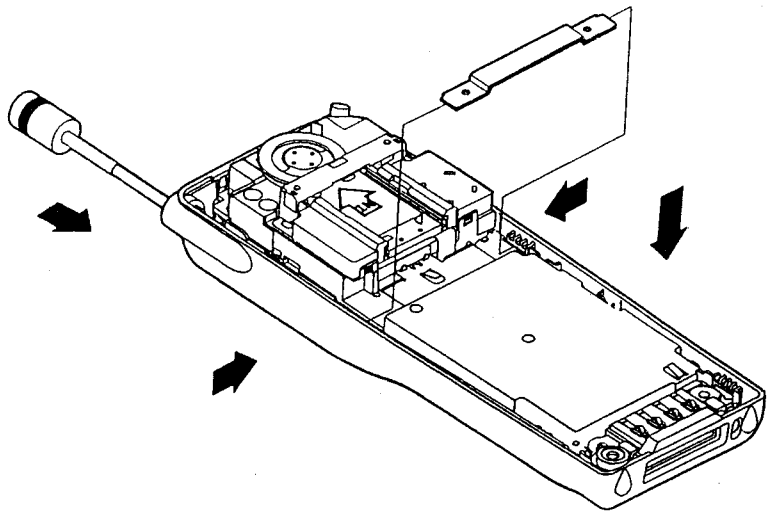


**Figure 5.2.15**

(15) Locate the back cover of the casing over the unit and secure with four screws located in each corner of the cover (refer to Figure 5.2.16).

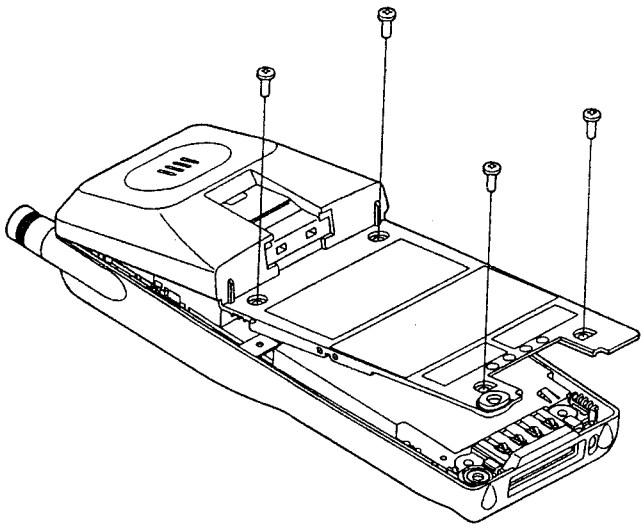


**Figure 5.2.16**

(16) Push the battery pack onto the back of the unit (refer to Figure 5.2.17).

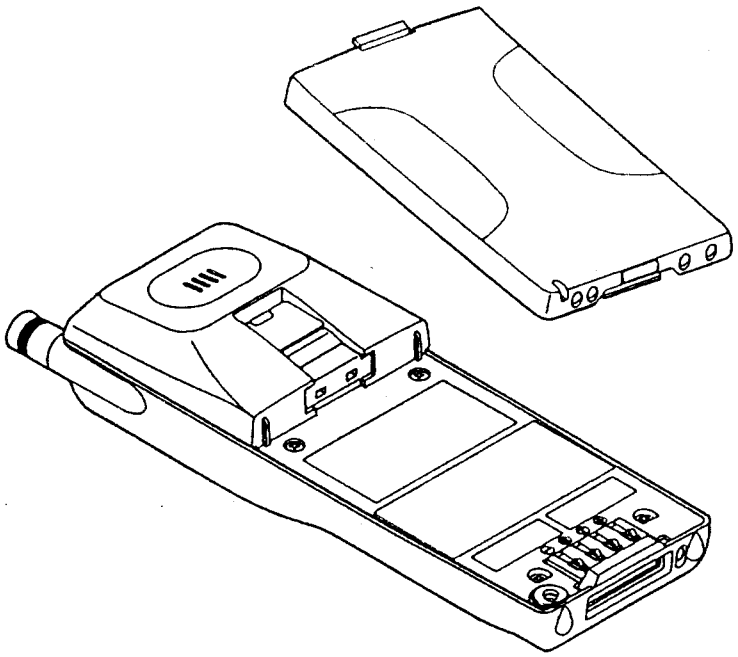


**Figure 5.2.17**

(17) Refit the access cover of the battery pack located at the base of the unit (refer to Figure 5.2.18).

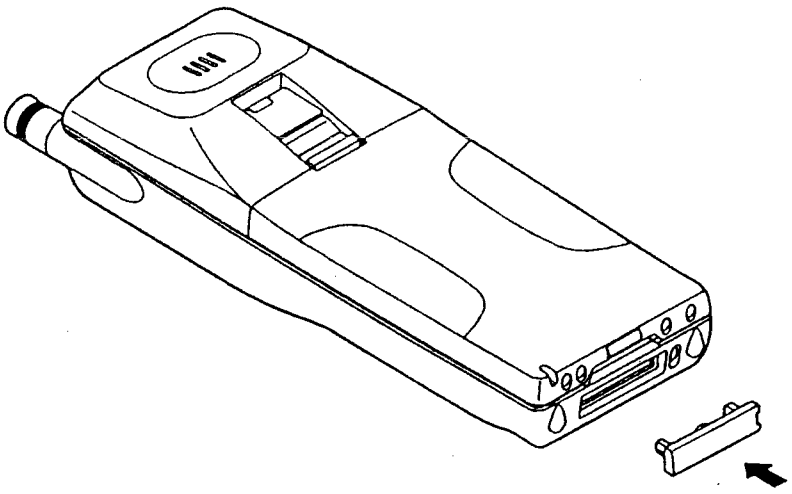


**Figure 5.2.18**

The unit is now fully reassembled and ready for operation.

## 5.3 HANDSFREE CRADLE

### Disassembly Instructions

(1) Remove the two screw caps, remove the two screws in the cradle cover and lift off the cover. Remove the case screw located on the bottom of the cradle (refer to Figure 5.3.1).

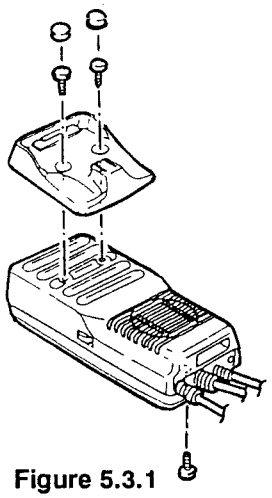


**Figure 5.3.1**

(2) Lift up the cover by pressing the front side of the cover (refer to Figure 5.3.2).

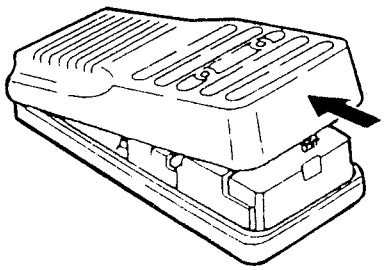


**Figure 5.3.2**

(3) Remove the speaker connector from the logic board (refer to Figure 5.3.3), remove the logic board from the case by pulling the connector side outward.

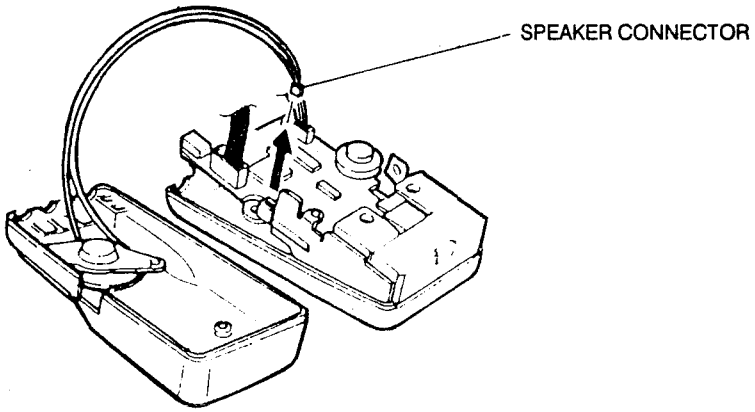



**Figure 5.3.3**

(4) Remove the screw in the charger unit and pull out the charger unit from the radiator.

(5) Remove the shield case from the charger unit.

**Assembly Instructions**

(1) Locate the logic board into the case ensuring the clips lock into position (refer to Figure 5.4.1).

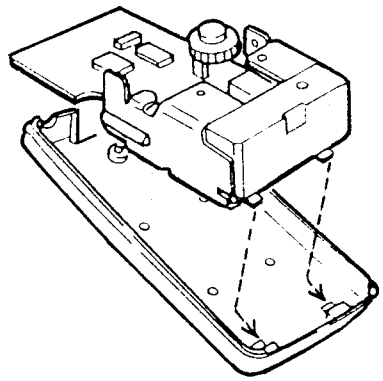


**Figure 5.4.1**

(2) Locate the coiled cord and RF cable into the case slots followed by the interconnecting cable while confirming the positions by the cable stoppers (refer to Figure 5.4.2).

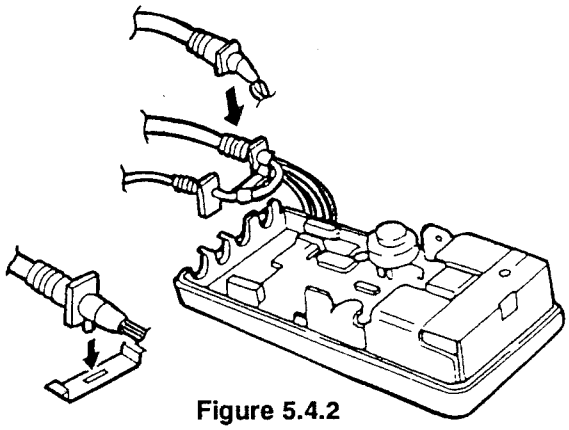


**Figure 5.4.2**

(3) Fit the connector part and clip down the case. Fasten using the screw (refer to Figure 5.4.3). Make sure the three projection terminals and holes are aligned correctly.

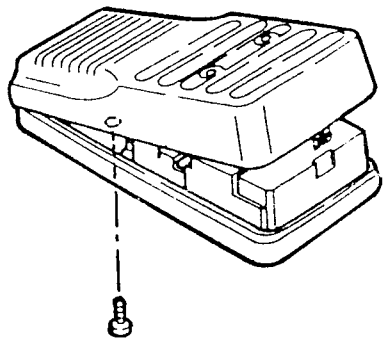


**Figure 5.4.3**

(4) Replace the cradle cover and secure using two screws. Replace the screw caps.

# 6. TECHNICAL SPECIFICATIONS

## 6.1 GENERAL

(1) Frequency range:
Tx : 890MHz to 915MHz
Rx : 935MHz to 960MHz

(2) Tx/Rx frequency separation : 45MHz

(3) RF channel bandwidth : 200kHz

(4) No. of RF channels : 124

(5) No. of user channels : 992 (124 x 8)

(6) Operating temperature : - 20°C to + 60°C

## 6.2 HANDPORTABLE UNIT

### 6.2.1 General

(1) Antenna terminal impedance : 50Ω

(2) Antenna VSWR : < 2.0:1

(3) RF output power : 2W

(4) DC supply voltage : 5.2V to 8.0V

(5) Dimensions (W x H x D) : 53 ±0.1 x 150.2 x 22mm

### 6.2.2 Tx Characteristics

(1) Frequency error : ±0.1ppm max., relative to base station frequency.

(2) Modulation phase error : RMS: ≤5°
: Peak: ≤20°

(3) Output RF spectrum due to modulation:

| OFFSET FROM CENTRE FREQUENCY (kHz) | MAX LEVEL RELATIVE TO THE CARRIER (dB) |
|---|---|
| ±100 | +0.5 |
| ±200 | - 30 |
| ±250 | - 33 |
| ±400 to 1800 | - 54 (integral antenna) |

(4) Output RF spectrum due to switching transients:

| OFFSET FROM CENTRE FREQUENCY (kHz) | MAX LEVEL (dBM) |
|---|---|
| ±400 | - 23 |
| ±600 | - 26 |
| ±1200 | - 32 |
| ±1800 | - 36 |

Measurement conditions for output RF spectrum measurements:

Frequency Span : 0

Measurement Bandwidth : 30 kHz

Video Bandwidth : 100 kHz

Peak hold

(5) Spurious emissions at the antenna connector

| FREQUENCY (MHz) | LIMITS (dBm) | | MEASUREMENT BW (kHz) | VIDEO BW (kHz) |
|---|---|---|---|---|
| | ACTIVE MODE | IDLE MODE | | |
| Offset from carrier (in Tx band) | | | | |
| ≥1.8 | ≤- 36 | - | 30 | 100 |
| ≥6.0 | ≤- 36 | - | 100 | 300 |
| Offset from Tx band edge | | | | |
| ≥2.0 | ≤- 36 | - | 30 | 100 |
| ≥5.0 | ≤- 36 | - | 100 | 300 |
| ≥10.0 | ≤- 36 | - | 300 | 1 MHz |
| ≥20.0 | ≤- 36 | - | 1 MHz | 3 MHz |
| ≥30.0 | ≤- 36 | - | 3 MHz | 10 MHz |
| Frequency bands | | | | |
| 935 - 960 | ≤79 (a & b) | - | 100 | 100 |
| 925 - 935 | ≤67 (a & b) | - | 100 | 100 |
| 1805 - 1880 | ≤71 (a & b) | - | 100 | 100 |
| 9 k - 1 GHz | | ≤- 57 | 100 | 100 |
| 1710 - 1785 | | ≤- 57 | 100 | 100 |
| 1805 - 1880 | | ≤- 57 | 100 | 100 |
| 1 G - 12.75 G | | ≤- 47 | 100 | 100 |

Measurement conditions:

Peak hold

Modulated carrier

(a) Measurement averaged over a burst and then averaged again over 50 bursts.

(b) In each of the bands 925 - 960 MHz and 1805 - 1880 MHz up to 5 spurii measurements can fail these limits, in which case the limit ≤- 36 dBm shall apply.

(6) Output level, dynamic operation

Power control steps:

| POWER CONTROL LEVEL (defined by GSM 05.05) | PEAK POWER (dBm) | TOLERANCE FOR CONDITIONS (dB) | |
|---|---|---|---|
| | | NORMAL | EXTREME |
| 5 | 33 | ±2 | ±2.5 |
| 6 | 31 | ±3 | ±4 |
| 7 | 29 | ±3 | ±4 |
| 8 | 27 | ±3 | ±4 |
| 9 | 25 | ±3 | ±4 |
| 10 | 23 | ±3 | ±4 |
| 11 | 21 | ±3 | ±4 |
| 12 | 19 | ±3 | ±4 |
| 13 | 17 | ±3 | ±4 |
| 14 | 15 | ±3 | ±4 |
| 15 | 13 | ±3 | ±4 |

(7) Residual peak power : ≤70 dBc (BW = 300 kHz)

(8) Tx level vs. Time mask for an active burst, see figure 1

### 6.2.3 Rx Characteristics

(1) Blocking

| INTERFERER FREQUENCY (MHz) | INTERFERER LEVEL (dBm) |
|---|---|
| Offset from wanted carrier (in band 915 - 980 MHz) | |
| ≥600 kHz | - 43 |
| ≥800 kHz | - 33 |
| ≥1.6 MHz | - 23 |
| Out of band frequency bands | |
| 0.1 - 915 | 0 |
| 980 - 12.75 GHz | 0 |

Measurement conditions:

Wanted carrier is 3 dB above reference sensitivity.

Interferer is CW.

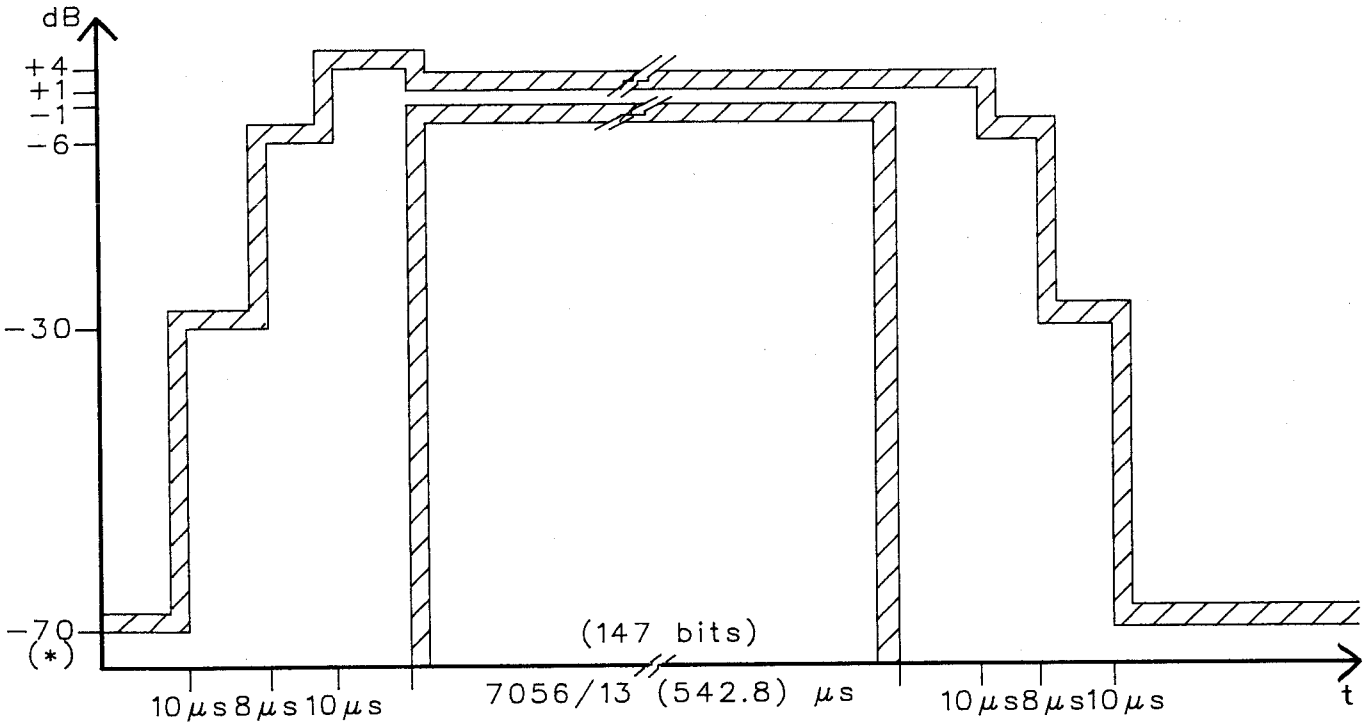
Spurious response exceptions:

6 exceptions are permitted IN band 915 - 980 MHz

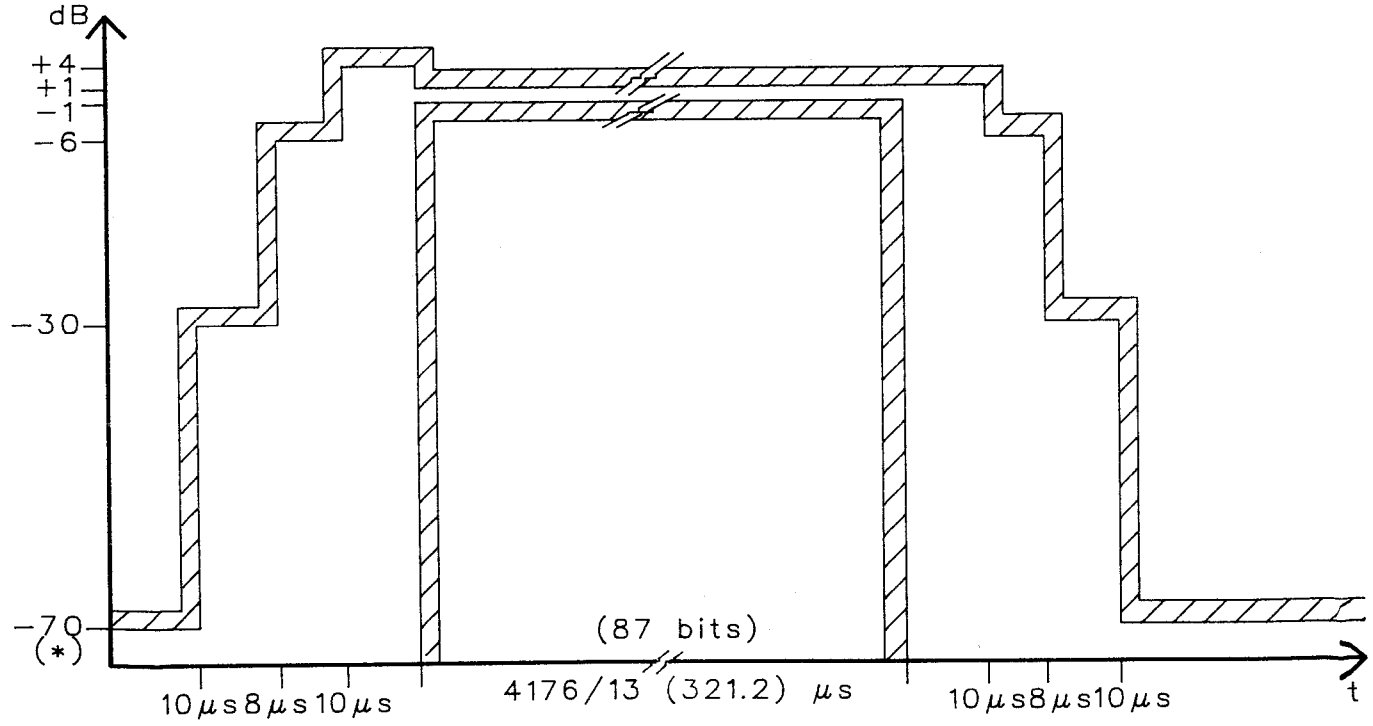
24 exceptions are permitted OUTSIDE band 915 - 980 MHz.

(2) Intermodulation characteristics:

| INTERFERER LEVEL (f1 & f2) dBm | INTERFERER FREQUENCIES (f1 & f2) |
|---|---|
| - 49 | Wanted frequency = 2f1 - f2 and \| f2 - f1 \| = 800 kHz |




TIME MASK FOR NORMAL DURATION BURSTS (NB, FB, DB AND SB)




TIME MASK FOR ACCESS BURST (AB)

(*) FOR GSM 900 or −36dBm whichever is higher

**Figure 1 Tx level vs time mask for an active burst**

Measurement conditions:

Wanted signal is 3 dBm above reference sensitivity

f1 is CW

f2 is modulated

## 6.3 BOOSTER

The characteristics given in the HPU specification are applicable to the booster with the following exceptions:

### 6.3.1 General

(1) RF output power : 8W

(2) DC supply voltage : 10.5V to 15.9V

### 6.3.2 Tx Characteristics

(1) Output RF spectrum due to modulation

As per the handportable with the following exceptions:

| OFFSET FROM CENTRE FREQUENCY (kHz) | MAX. LEVEL RELATIVE TO THE CARRIER (dB) |
|---|---|
| ±400 | - 60 |
| ±600 to 1800 | - 66 |

Measurement conditions:

Frequency span : 0

Measurement BW : 30 kHz

Video BW : 100 kHz

Peak hold

(2) Output RF spectrum due to switching transients

| OFFSET FROM CENTRE FREQUENCY (kHz) | MAXIMUM LEVEL MEASURED (dBm) | |
|---|---|---|
| | $P_{out} \leq 37$ dBm | $P_{out} = 39$ dBm |
| ±400 | - 23 | - 21 |
| ±600 | - 26 | - 26 |
| ±1200 | - 32 | - 32 |
| ±1800 | - 36 | - 36 |

Measurement conditions:

Frequency span : 0

Measurement BW : 30 kHz

Video BW : 100 kHz

Peak hold

(3) Output level, dynamic operation

Power control steps

As per the handportable, with the following exceptions:

| POWER CONTROL LEVEL (defined by GSM 05.05) | PEAK POWER (dBm) | TOLERANCE FOR CONDITIONS (dB) | |
|---|---|---|---|
| | | NORMAL | EXTREME |
| 2 | 39 | ±2 | ±2.5 |
| 3 | 37 | ±3 | ±4 |
| 4 | 35 | ±3 | ±4 |
| 5 | 33 | ±3 | ±4 |

(4) Reference sensitivity

Reference sensitivity ≤-102 dBm. This is specified in terms of FER, BER and RBER (as appropriate) in GSM 05.05.

Reference sensitivity performance

| TYPE OF CHANNEL | PROPOGATION CONDITIONS | | | | |
|---|---|---|---|---|---|
| | STATIC | TU50 (no FH) | TU50 (ideal FH) | RA250 (no FH) | HT100 (no FH) |
| SDCCH (FER) | 0.1% | 13% | 8% | 8% | 12% |
| RACH (FER) | 0.5% | 13% | 13% | 12% | 13% |
| SCH (FER) | 1% | 16% | 16% | 15% | 16% |
| TCH/9.6 & H4.8 (BER) | $10^{-5}$ | 0.5% | 0.4% | 0.1% | 0.7% |
| TCH/F4.8 (BER) | - | $10^{-4}$ | $10^{-4}$ | $10^{-4}$ | $10^{-4}$ |
| TCH/F2.4 (BER) | - | $2x10^{-4}$ | $10^{-5}$ | $10^{-5}$ | $10^{-5}$ |
| TCH/H2.4 (BER) | - | $2x10^{-4}$ | $10^{-4}$ | $10^{-4}$ | $10^{-4}$ |
| TCH/FS (BER) | 0.1∝% | 6∝% | 3∝% | 2∝% | 7∝% |
| class Ib (RBER) | 0.4∝% | 0.4/∝% | 0.3/∝% | 0.2/∝% | 0.5/∝% |
| class II (RBER) | 2% | 8% | 8% | 7% | 9% |

See Notes.

(5) Co channel interference

Carrier to interferer ratio, C/I ≤9 dB. This is specified in terms of FER, BER and RBER (as appropriate) in GSM 05.05.

Wanted signal = -85 dBm

Interferer is modulated

Receiver interferer performance

| TYPE OF CHANNEL | PROPOGATION CONDITIONS | | | | |
|---|---|---|---|---|---|
| | TU3 (no FH) | TU3 (ideal FH) | TU50 (no FH) | TU50 (ideal FH) | RA250 (no FH) |
| SDCCH (FER) | 22% | 9% | 13% | 9% | 8% |
| RACH (FER) | 15% | 15% | 16% | 16% | 13% |
| SCH (FER) | 17% | 17% | 17% | 17% | 18% |
| TCH/9.6 & H4.8 (BER) | 8% | 0.3% | 0.8% | 0.3% | 0.2% |
| TCH/F4.8 (BER) | 3% | $10^{-4}$ | $10^{-4}$ | $10^{-4}$ | $10^{-4}$ |
| TCH/F2.4 (BER) | 3% | $10^{-5}$ | $3x10^{-5}$ | $10^{-5}$ | $10^{-5}$ |
| TCH/H2.4 (BER) | 4% | $10^{-4}$ | $2x10^{-4}$ | $10^{-4}$ | $10^{-4}$ |
| TCH/FS (BER) | 21∝% | 3∝% | 6∝% | 3∝% | 3∝% |
| class Ib (RBER) | 2/∝% | 0.2/∝% | 0.4/∝% | 0.2/∝% | 0.2/∝% |
| class II (RBER) | 4% | 8% | 8% | 8% | 8% |

See Notes.

Note 1: The specification for SDCCH applies also for BCCH, AGCH, PCH, SACCH, FACCH. The actual performance of SACCH, particularly for the C/I TU3 (no FH) and TU 1.5 (no FH) cases should be better.

Note 2: Definitions:

FER: Frame Erasure Rate

BER: Bit Error Rate

RBER: Residual bit error rate (defined as the ratio of errors detected over the frames defined as "good" to the number of transmitted bits in the "good" frames.)

Note 3: $1 \leq \propto \leq 1.6$. The value of ∝ can be different for each channel condition but must remain the same for FER and class Ib RBER measurements for the same channel condition.

Note 4: FER for CCHs takes into account frames which are signalled as being erroneous (by the FIRE code, parity bits or other means) or where the stealing flags are wrongly interpreted.

Note 5: Ideal FH case assumes perfect decorrelation between bursts. This case may only be tested if such decorrelation is ensured in the test.

(5) Adjacent channel interference

| INTERFERER OFFSET FROM WANTED CHANNEL (kHz) | CARRIER TO INTERFERER RATIO, C/I (dB) |
|---|---|
| ±200 | - 9 |
| ±400 | - 41 |
| ±600 | - 49 |

Wanted signal = - 85 dBm

Interferer is modulated

### 6.3.3 Rx Characteristics

(1) Blocking

As per the handportable spec with the following exceptions:

| INTERFERER FREQUENCY (MHz) | INTEFERER LEVEL (dBm) |
|---|---|
| Offset from wanted carrier (in band 915 - 980 MHz) ≥600 kHz | - 38 |

(2) Intermodulation characteristics

| INTERFERER LEVEL (f1 & f2) dBm | INTEFERER FREQUENCIES (f1 & f2) |
|---|---|
| - 43 | Wanted frequency = 2f1 - f2 and I f2 - f1 I = 800 kHz |

Measurement conditions:

Wanted signal is 3 dBm above reference sensitivity

f1 is CW

f2 is modulated

(3) Reference sensitivity: ≤-104 dBm. This specified in terms of FER, BER and RBER (as appropriate) in GSM 05.05, shown earlier.

## 6.4 HANDSFREE MAIN UNIT

### 6.4.1 General

(1) Power voltage : 13.2 V ±20%

(2) Power consumption : < 200 mA

(3) Over voltage protection : 19 ±1V

(4) Low voltage protection : 10 ±1V

(5) Output audio level : -18 dBv ±1 dBv (at 1 kHz)

(6) Mute level : ≤ - 50 dBv (output)
: ≤ - 50 dBv (input)

(7) Cancel level : -4 ±1 dBv

(8) Input audio level : -18 ±1 dBv (at 1 kHz)

(9) Speaker level : -18 ±1 dBv (at 1 kHz)

(10) Microphone input level : -53 ±1 dBv (at 1 kHz)

(11) Noise level : ≤ - 45 dBv (output)
: ≤ - 45 dBv (input)

## 6.5 HANDSFREE CHARGER

### 6.5.1 General

(1) Input voltage : 10.8 to 16.6V

(2) No load current : < 25 mA

(3) Mode:
Charge mode
NiMH : 7.65V dc, 550 mA
NiCd : 7.65V dc, 800 mA
Adaptor mode : 7.32 ±0.1V dc, 800 mA

(4) Charge current
NiMH : 550 mA ±55 mA
NiCd : 800 mA ±80 mA

(5) Charge time
NiMH : ≈ 60 min
NiCd : ≈ 80 min

(6) Trickle charge current
Logic power L : 130 mA ±40 mA
Logic power H : 20 mA ±15 mA

(7) - ΔV control
- ΔV detect voltage : 150 mV max

(8) Thermister
< 4.2 ±0.4 kΩ : If thermister value is outside limits, charger will be in trickle charge mode.
> 25.4 ±4 kΩ

< 5.2 ±0.6 kΩ : If thermister value is outside limits, charger will be in rapid charge mode.
>25.5 ±4 kΩ

(9) Protection timer
Initial timer : 160 sec
Peak timer : 480 sec
Total timer : 6000 sec

(10) Restart voltage : 6.8 ±0.2V
After rapid charge, if battery voltage falls below limits, rapid charge will restart

(11) Increase current voltage : 6.3 ±0.3V
If a logic power signal is received in trickle charge mode, charger increases current to 800 mA

(12) Maximum output voltage : 9.5 ±0.3V

(13) Operating temperature : - 10 to 45°C

(14) Storage temperature : - 20 to 70°C

(15) Display

| | RAPID INF | TRICKLE INF |
|---|---|---|
| During rapid charging | L | H |
| After rapid charging | H | L |
| Adaptor mode | H | H |
| Abnormal 1 * | H | H |
| Abnormal 2 ** | Flash (1 Hz) | H |

Key
- L - Turn LED ON
- H - Turn LED OFF
- * - + terminal of battery is abnormal, thermo terminal is normal
- ** - High temperature protection is normal

## 6.6 DUAL TRICKLE CHARGER

### 6.6.1 Function

(1) Can charge two batteries at the same time.

(2) Charge time ≈ 8 hours

(3) If H/H is turned on whilst in battery's main slot, charger current increases by 50 mA.

(4) Charger can determine battery type by batt-id signal

(5) Charger is aware of battery status, whether connected to charger or not, via temp signal

### 6.6.2 Performance

(1) Input voltage : 12.5 ±2V, 400 mA

(2) Charge current
- Power OFF : 145 ±15 mA
  : 80 ±10 mA
- Power ON : 195 ±15 mA
  : 135 ±10 mA

(3) Charger time : 8 ±0.5 hrs

(4) Max input voltage : 9.5V

(5) Display (RED)
- During charge : RED
- After charge : GREEN
- No battery : put out LED

(6) Operating temperature : 0 to 40°C

(7) Storage temperature : - 20 to 70°C

### 6.6.3 Specifications

(1) Rated input : 13.2V dc, 400 mA

(2) Rated charger output

| | | H/H OFF | H/H ON |
|---|---|---|---|
| Slot 1: | | | |
| NiCd | Current | 145 mA | - |
| | Time | 10h | - |
| NiMH | Current | 95 mA | - |
| | Time | 10h | - |
| Slot 2: | | | |
| NiCd | Current | 145 mA | 195 mA |
| | Time | 10h | 10h |
| NiMH | Current | 95 mA | 145 mA |
| | Time | 10h | 10h |

(3) Applicable battery
NiMH : EB-P10181, 6V, 500 mAH
NiCd : EB-P10154, 6V, 900 mAH

(4) Ambient temperature range
Usage : 0 to 40°C
Storage : - 5 to 60°C

(5) Dimension (W x H x D) : 150 x 130 x 65 mm

(6) Weight : 240 g

## 6.7 DUAL RAPID CHARGER

### 6.7.1 Function

(1) Will only charge one battery at a time

(2) Gives priority to main slot

(3) Following rapid charge, automatically switches to trickle charging

### 6.7.2 Performance

(1) Charger time
NiMH : ≈ 60 min
NiCd : ≈ 80 min

(2) Input voltage : 13.8V (+20% - 15%)

(3) Charge current (rapid)
NiMH : 550 ±50 mA
NiCd : 800 ±50 mA
Charge current (trickle)
NiMH : 20 ±15 mA
NiCd : 25 ±20 mA

(4) Temperature protection
Thermistor resistor value

| | |
|---|---|
| > 25.4 ±4 KΩ | : Trickle charge |
| < 5.2 ±0.6 kΩ | : Trickle charge |
| > 5.2 ±0.6 kΩ | : Rapid charge |
| < 4.2 ±0.4 kΩ | : Trickle charge |

(5) Charger control
-ΔV : 150 mV max (speed: - 2 mV/sec)

(6) Protection

| | |
|---|---|
| Initial timer | : 160 sec |
| Peak timer | : 480 sec |
| Total charge timer | : 6000 sec |

(7) Off timer : 47 hrs

(8) -ΔV No control
-ΔV no working area : 7 ±0.3V
If battery voltage falls below range, -ΔV control function fault

(9) Restart voltage of rapid charge 1 : 6.8 ±0.4V
Five seconds after -ΔV, if battery voltage falls below this range, rapid charge will restart

(10) Restart voltage of rapid charge 2 : 6.4 ±0.2V
After -ΔV, if battery voltage falls below range, rapid charge will restart

(11) Increase current voltage : 5.9 ±0.5V
During trickle charge, if voltage falls below range, charger current increases to 100 mA

(12) Maximum output voltage : 9.5V

(13) Display:

| | |
|---|---|
| Rapid charge | : GREEN |
| Trickle charge after -ΔV | : RED |
| Rapid charge after -ΔV | : RED |
| Off timer | : GREEN |

(14) Operating temperature : 0 to 40°C

(15) Storage temperature : - 20 to 70°C

## 6.8 AC ADAPTOR 1 FOR DUAL TRICKLE CHARGER

### 6.8.1 Electrical Characteristics - UK Type EB-P0380/EB-P0381

(1) Primary rated voltage and rated frequency : AC 240V, 50 Hz

(2) Secondary rated voltage and rated current : Ouput DC 12.5V, 400 mA

(3) Operating temperature range : - 10 to 40°C

(4) No load input current : At rated input voltage, input current must not exceed 30 mA rms with NO load

| | | |
|---|---|---|
| (5) | Actual output voltage (resistive load, ambient temperature 25°C, measured with moving coil type instrument) | : At AC 240V Input DC 400 mA load, 12 to 13V DC |
| (6) | Dielectric strength | : Between input plug pins and output terminals 4800V for 2 seconds |
| (7) | Insulation resistance | : Between input plug pins and output terminals/case 100 MΩ minimum at 500V dc |
| (8) | Temperature rise at 240V input voltage | : Windings 80° max at dc 400 mA load<br>: Outer surface 60° max at dc 400 mA load |
| (9) | Short circuit protection | : With input voltage of 264V and output terminal short circuited. There shall be no risk of fire and no live parts shall be made accessible |
| (10) | Visual inspection | : The outer case shall be of uniform colour and without distortion. Surface scratches shall be no worse than agreed sample |
| (11) | Cord strain relief | : To withstand at least 5 kg pull for 1 second 25 times, maximum displacement of cord 2 mm |
| (12) | Thermal fuse protection | : Thermal fuse to be fitted in primary winding |

### 6.8.2 Electrical Characteristics - Europe Type EB-P0981/EB-P70017

| | | |
|---|---|---|
| (1) | Primary rated voltage and rated frequency | : AC 220V, 50 Hz |
| (2) | Secondary rated voltage and rated current | : Ouput DC 12.5V, 400 mA |
| (3) | Operating temperature range | : - 10 to 40°C |
| (4) | No load input current | : At rated input voltage, input current must not exceed 30 mA rms with NO load |
| (5) | Actual output voltage (resistive load, ambient temperature 25°C, measured with moving coil type instrument) | : At AC 220V Input DC 400 mA load, 12 to 13V DC |
| (6) | Dielectric strength | : Between input plug pins and output terminals 4800V for 2 seconds |
| (7) | Insulation resistance | : Between input plug pins and output terminals/case 100 MΩ minimum at 500V dc |
| (8) | Temperature rise at 220V input voltage | : Windings 80° max at dc 400 mA load<br>: Outer surface 60° max at dc 400 mA load |
| (9) | Short circuit protection | : With input voltage of 233V and output terminal short circuited. There shall be no risk of fire and no live parts shall be made accessible |

| | | |
|---|---|---|
| (10) | Visual inspection | : The outer case shall be of uniform colour and without distortion. Surface scratches shall be no worse than agreed sample |
| (11) | Cord strain relief | : To withstand at least 5 kg pull for 1 second 25 times, maximum displacement of cord 2 mm |
| (12) | Thermal fuse protection | : Thermal fuse to be fitted in primary winding |

## 6.9 AC ADAPTOR 2 FOR DUAL RAPID CHARGER

### 6.9.1 Electrical Characteristics - UK Type EB-P10408/EB-P10427

| | | |
|---|---|---|
| (1) | Primary rated voltage and rated frequency | : AC 240V, 50 Hz |
| (2) | Secondary rated voltage and rated current | : Ouput DC 15.6V, 800 mA |
| (3) | Operating temperature range | : - 10 to 40°C |
| (4) | No load input current | : At rated input voltage, input current must not exceed 40 mA rms with NO load |
| (5) | Actual output voltage (resistive load, ambient temperature 25°C, measured with moving coil type instrument) | : At AC 240V Input DC 800 mA load, 15.6V ±1V DC |
| (6) | Dielectric strength | : Between input plug pins and output terminals 4800V for 2 seconds |
| (7) | Insulation resistance | : Between input plug pins and output terminals/case 100 MΩ minimum at 500V dc |
| (8) | Temperature rise at 240V input voltage | : Windings 80° max at dc 800 mA load<br>: Outer surface 60° max at dc 800 mA load |
| (9) | Short circuit protection | : With input voltage of 254V and output terminal short circuited. There shall be no risk of fire and no live parts shall be made accessible |
| (10) | Visual inspection | : The outer case shall be of uniform colour and without distortion. Surface scratches shall be no worse than agreed sample |
| (11) | Cord strain relief | : To withstand at least 5 kg pull for 1 second 25 times, maximum displacement of cord 2 mm |
| (12) | Thermal fuse protection | : 125°C Thermal fuse to be fitted in primary winding |

### 6.9.2 Electrical Charactristics - Europe Type EB-P10322/EB-P70017

| | | |
|---|---|---|
| (1) | Primary rated voltage and rated frequency | : AC 230V, 50 Hz |
| (2) | Secondary rated voltage and rated current | : Ouput DC 16.5V, 800 mA |

| | | |
|---|---|---|
| (3) | Operating temperature range | : - 10 to 40°C |
| (4) | No load input current | : At rated input voltage, input current must not exceed 40 mA rms with NO load |
| (5) | Actual output voltage (resistive load, ambient temperature 25°C, measured with moving coil type instrument) | : At AC 230V Input DC 800 mA load, 16.5V ±1V DC |
| (6) | Dielectric strength | : Between input plug pins and output terminals 4800V for 2 seconds |
| (7) | Insulation resistance | : Between input plug pins and output terminals/case 100 MΩ minimum at 500V dc |
| (8) | Temperature rise at 230V input voltage | : Windings 80° max at dc 800 mA load<br>: Outer surface 60° max at dc 800 mA load |
| (9) | Short circuit protection | : With input voltage of 243V and output terminal short circuited. There shall be no risk of fire and no live parts shall be made accessible |
| (10) | Visual inspection | : The outer case shall be of uniform colour and without distortion. Surface scratches shall be no worse than agreed sample |
| (11) | Cord strain relief | : To withstand at least 5 kg pull for 1 second 25 times, maximum displacement of cord 2 mm |
| (12) | Thermal fuse protection | : 125°C Thermal fuse to be fitted in primary winding |

## 6.10 DC ADAPTOR

### 6.10.1 General

| | | |
|---|---|---|
| (1) | Operating temperature | : 0 to 45°C<br>: - 20 to 65°C |
| (2) | Storage temperature | : - 20 to 70°C |
| (3) | Humidity test | : +75°C, 90 to 95% RH for 48 hrs. Power supply shall meet requirements after 120 mins at room temperature and humidity |
| (4) | Shock test | : After dropping from 75 cm height onto floor in each of X, Y and Z directions once. PSU shall meet requirements specified. Scratches on casing are acceptable |
| (5) | Vibration test | : After applying vibration 20 - 150 - 20 Hz/20 min in X, Y and Z directions for one hour each, PSU meets requirements specified |
| (6) | Dimensions (W x L x H) | : 60 x 46 x 14.6 mm |
| (7) | Weight | : 25 g |
| (8) | Cooling | : Convection cooling |

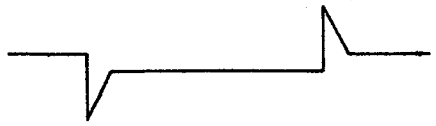
### 6.10.2 Electrical Characteristics

(1) Input voltage range : DC 10.8 to 18V

(2) Output voltage range : DC 6.5V ±10%

(3) Dynamic load response : DC 6.5V ±10%

Output voltage



Output current

(4) Output ripple voltage : 60 mV p-p (Ta = - 20 to +45°C)
: 180 mV p-p (Ta = - 20 to +65°C)

(5) Output short circuit protection : PSU shall not catch fire or smoke

(6) DC power failure : PSU shall be recovered normally after dc power fail recovery

(7) Static electricity test : Applied voltage = 15 kV
: Discharge capacitor = 200 pF
: Discharge count = 5 times
: PSU shall not catch fire or smoke and shall meet the requirements specified

(8) Overvoltage protection : Output voltage = 9 to 12V (Zener clamp method)
: Power supply does not recover automatically

(9) Overcurrent protection : Output current = 2.2 A min
: Power supply recovers automatically

# 7. TEST AND MEASUREMENT

## 7.1 HARDWARE INTERFACES

This section details the signals which are accessible via the connector interfaces on the Handportable (HPU), Booster and Handsfree (HF).

### 7.1.1 HANDPORTABLE UNIT (HPU) INTERFACES

**Connector J1, Key pad Interface**

| PIN | SIGNAL | DESCRIPTION |
|---|---|---|
| 1 | KEY ROW 1 | Key pad row control 1 |
| 2 | PWR-KEY | Power control key, initialises on/off sequences. Active low while pressed |
| 3 | KEY ROW 4 | Key pad row control 4 |
| 4 | KEY ROW 3 | Key pad row control 3 |
| 5 | KEY ROW 2 | Key pad row control 2 |
| 6 | KEY COL 2 | Key pad column control 2 |
| 7 | KEY COL 3 | Key pad column control 3 |
| 8 | KEY COL 1 | Key pad column control 1 |
| 9 | GROUND | |
| 10 | KEY COL 5 | Key pad column control 5 |
| 11 | KEY COL 6 | Key pad column control 6 |
| 12 | KEY COL 4 | Key pad column control 4 |

**Connector J2, Smart Card Interface**

| PIN | SIGNAL | DESCRIPTION |
|---|---|---|
| 1 | 5V SIM | 5V supply derived from DIG2 via U42, enabled by U10 pin 54 Hi |
| 2 | SMART CARD RST | Reset signal from U10 pin 53 |
| 3 | SMART CARD CLK | Clock signal from U10 pin 52 |
| 4 | GROUND | |
| 5 | SMART CARD I/O | Smart card serial I/O to and from U10 pin 51 |
| 6 | nSIM-PWR | Smart card power |
| 7 | RCVRP | Speaker (+) |
| 8 | RCVRN | Speaker (-) |

**Connector J3, Digital Audio Interface**

| PIN | SIGNAL | DESCRIPTION |
|---|---|---|
| 1 | DAICLK | DAI clock |
| 2 | DAIRST | DAI reset, from U15 pin 88 |
| 3 | DAITxDATA | Transmit audio speech data from U15 pin90 |
| 4 | DAIRxDATA | Receive audio speech data from U15 pin 88 |

**Connector J4, External Interface**

| PIN | SIGNAL | DESCRIPTION |
|---|---|---|
| 1 | GROUND | |
| 2 | AUDIO IN | Audio input from HF Mic and amps |
| 3 | LOGIC PWR | Power status signal, micro-controller to HF |
| 4 | AUDIO OUT | Receive audio from SP to HF speaker amplifier |
| 5 | BAT TEMP | Indicates battery temperature to charger via HF |
| 6 | BAT ID | Battery capacity indicator from battery |
| 7 | PA GATING | Control waveform for booster amplifier via HF.<br>Battery temperature indicator from battery |
| 8 | BAT ID | Battery capacity indicator from battery |
| 9 | GROUND | |
| 10 | RF BOOST | Combined RF signals, Tx, 1st LO and 1st IF |
| 11 | GND REF | |
| 12 | BAT TEMP | Battery temperature indicator from battery |
| 13 | Tx WIN | Indicates useful part of the burst (bits 0-147) to booster via HF |
| 14 | SER OUT | Serial data from micro-controller to HF |
| 15 | SER IN | Serial data from HF to micro-controller |
| 16 | IGN SENSE | Active high input to HPU from HF. Upon activation micro-controller adopts previous status (on/off) |
| 17 | EXT PWR | Rapid or trickle charge supply from charger via HF |
| 18 | GROUND | |
| 19 | VBAT | Positive battery supply, 4 cell |

## 7.1.2 BOOSTER INTERFACES

**Connector P601: Handsfree Connector**

| PIN | SIGNAL | DESCRIPTION |
|---|---|---|
| 1 | GROUND | |
| 2 | CAR BATTERY | Power +13.2V ±20% |
| 3 | RADIO MUTE BAR | Automatic radio mute control<br>Mute: Lo (GND) Unmute: Hi (open cct) |
| 4 | IGNITION | Ignition ON: Car battery<br>Ignition OFF: Open Circuit |
| 5 | CALL ALERT BAR | Call alert control unit<br>ON: Lo (GND), OFF: Hi (open cct) |
| 6 | SW CONT BAR | Power state output for the booster:<br>SW CONT ON: LO (GND)<br>SW CONT OFF: HI |
| 7 | PA GATING BAR | PA GATING signal from the TC chip to the power booster |
| 8 | Tx WINDOW BAR | Tx WINDOW signal from the TC chip to the power booster |
| 9 | PL0 | Parallel power level 0 (lower bit) and detection of the booster<br>Connect Booster: Hi<br>No Booster: Lo |
| 10 | PL1 | Parallel power level 1 |
| 11 | PL2 | Parallel power level 2 |
| 12 | PL3 | Parallel power level 3 (upper bit) |

**Connector P602: Power Connector**

| PIN | SIGNAL | DESCRIPTION |
|---|---|---|
| 1 | IGNITION | Ignition ON: Car Battery<br>Ignition OFF: Open Circuit |
| 2 | RADIO MUTE | Automatic radio mute control<br>Mute: Lo (GND), Unmute: Hi (open cct) |
| 3 | NC | |
| 4 | CALL ALERT | Call alert control unit<br>ON: Lo (GND), OFF: Hi (open cct) |
| 5 | GROUND | |
| 6 | CAR BATTERY | Power +13.2V ±20% |

### 7.1.3 HANDSFREE INTERFACES

**Connector P501: Handportable Interface**

| PIN | SIGNAL | DESCRIPTION |
|---|---|---|
| 1 | AUDIO (R) | Audio signal from H/F to HPU:<br>Output impedance: 100 Ω<br>Nominal level: - 18 dBm |
| 2 | LOGIC POWER BAR | Power state output from HPU:<br>Logic power ON: Lo<br>Logic power OFF: Hi |
| 3 | AUDIO (F) | Audio signal from HPU to HF:<br>Input impedance: 10 kΩ<br>Nominal level: - 18 dBm |
| 4 | BATT ID | To detect battery type (following internal resistor)<br>550 mAh battery: 470 kΩ<br>900 mAh battery: 4.7 kΩ |
| 5 | TEMP | To measure battery temperature with thermistor:<br>Thermistor value @ 25°C:10 kΩ<br>43°C: 5.2 kΩ<br>-10°C: 42.5 kΩ<br>50°C: 4.2 kΩ |
| 6 | PA GATING | PA GATING signal from the TC chip to the power booster |
| 7 | Tx WINDOW | Tx WINDOW signal from the TC chip to the power booster |
| 8 | SERIAL (F) | Serial data from HPU to H/F,<br>Data speed: 9600 bps |
| 9 | SERIAL (R) | Serial data from H/F to HPU,<br>Data speed: 9600 bps |
| 10 | IGN SENSE | Ignition sense signal (CMOS level output)<br>Ignition ON: Hi<br>Ignition OFF: Lo |
| 11 | EXT POWER | External power for charging battery and main power<br>Nominal voltage: 7.65V (charging)<br>7.3V (adaptor)<br>Maximum voltage: 9.5 ±0.3V |
| 12 | GND | |

**Connector P502: DC Adaptor**

| PIN | SIGNAL | DESCRIPTION |
|---|---|---|
| 1 | Vcc | Power +12.5 ±20% |
| 2 | EXT POWER | Power for charging battery and main power<br>Nominal voltage: 7.65V (charging)<br>7.3V (adaptor)<br>Maximum voltage: 9.5 ±0.3V |
| 3 | TEMP | To measure battery temperature with thermistor:<br>Thermistor value @ 25°C:10 kΩ<br>43°C: 5.2 kΩ<br>-10°C: 42.5 kΩ<br>50°C: 4.2 kΩ |
| 4 | LOGIC POWER | HPU power state:<br>Logic power ON: Lo<br>Logic power OFF: Hi |
| 5 | CARRIER ON | HPU condition (when logic power is ON)<br>High (open collector): Idle mode<br>Low (GND): Conversation mode |
| 6 | BATT ID | To detect battery type (following internal resistor)<br>550 mAh battery: 470 kΩ<br>900 mAh battery: 4.7 kΩ |
| 7 | RAPID INF | Information of rapid charge for dc adaptor |
| 8 | TRICKLE INF | Information of trickle charge from dc adaptor |
| 9 | GND | |
| 10 | GND | |

**Connector P503.1: Booster/Power Interface**

| PIN | SIGNAL | DESCRIPTION |
|---|---|---|
| 1 | GROUND | |
| 2 | CAR BATTERY | Power +13.2V ±20% |
| 3 | RADIO MUTE BAR | Automatic radio mute control<br>Mute: Lo (GND) Unmute: Hi (open cct) |
| 4 | IGNITION | Ignition ON: Car battery<br>Ignition OFF: Open Circuit |
| 5 | CALL ALERT BAR | Call alert control unit<br>ON: Lo (GND), OGG: Hi (open cct) |
| 6 | SW CONT BAR | Power state output for the booster:<br>SW CONT ON: LO (GND)<br>SW CONT OFF: HI |
| 7 | PA GATING | PA GATING signal from the TC chip to the power booster |
| 8 | Tx WINDOW | Tx WINDOW signal from the TC chip to the power booster |
| 9 | PL0 | Parallel power level 0 (lower bit) and detection of the booster<br>Connect Booster: Hi<br>No Booster: Lo |
| 10 | PL1 | Parallel power level 1 |
| 11 | PL2 | Parallel power level 2 |
| 12 | PL3 | Parallel power level 3 (upper bit) |

## 7.2 HPU TEST POINTS

The following signal test points are provided on the logic section of the handportable unit PCB.

| TEST POINT | SIGNAL | ASSOCIATED DEVICES |
|---|---|---|
| 1 | 5V DIGI | |
| 2 | FLASH VP | Micro-controller, Flash EPROMS |
| 3 | SCI-TxD | Micro-controller, TIM (TC), SP |
| 4 | SCI-RxD | Micro-controller, TIM (TC) |
| 5 | IPIPE/DS0 | Micro-controller |
| 6 | IFETCH/DS1 | Micro-controller |
| 7 | nBKPT/DSCLK | Micro-controller |
| 8 | CPU-RESET-BAR | Micro-controller, SP, ANA |
| 9 | FREEZE | Micro-controller |
| 10 | nBERR | Micro-controller |
| 11 | nDS | Micro-controller |
| 12 | GND | |

## 7.3 TEST COMMAND MODE

The engineering test mode facility is designed to allow various sections of the HPU to be enabled and exercised for test and fault finding purposes.

A password adaptor is used to restrict access to test command mode. Tests are enabled using test commands entered via the keypad.

The test commands are divided into 9 groups:

Group 0, General commands

Group 1, General RF commands

Group 2, Transmit commands

Group 3, Receive commands

Group 4, Audio commands

Group 5, Identification commands

Group 6, Memory data access commands

Group 7, Miscellaneous commands

Group 8, Test function select commands

On successful implementation of a test command the display will either read "PASS" or display the parameter requested.

If an implementation of a test command is unsuccessful, the display will read "FAIL".

**Table 7.1 Test Commands**

| COMMAND | GROUP | KEY OPERATION | FUNCTION |
|---|---|---|---|
| Request test mode | 0 | [F] [+] | Enter test mode<br>The display will show:<br>x x x x x y1 z z z z<br>y2<br>where: x = software version<br>y1 = pcb version<br>y2 = EEPROM version<br>z = EPROM checksum |
| Terminate test mode | 0 | [↩] | Exit test mode |
| Initialise phone | 0 | [0] [0] [↩] | Performs the following initialisation operations:<br>1. Stop RF functions<br>2. Initialise ASICs<br>3. Set channel to 62<br>4. Set power level to 15<br>5. Mute Rx-audio & Tx audio<br>6. Disable DTMF and audio tones |
| Change channel No. | 1 | [1] [0] [↩]<br>(x) (x) x [↩] | Change RF channel:<br>xxx = channel 1 to channel 124<br>Controlled by Digiphase |

**Table 7.1 Test Commands (cont'd)**

| COMMAND | GROUP | KEY OPERATION | FUNCTION |
|---|---|---|---|
| Change Rx, Tx, and MON channel No. | 1 | [1] [1] [↷]<br>(x) (x) x [↷]<br>(y) (y) y [↷]<br>(z) (z) z [↷] | Change Rx, Tx, MON channel:<br>xxx = 0 - 124 for Rx channel<br>yyy = 0 - 124 for Tx channel<br>zzz = 0 - 124 for MON channel<br>If channel 0 is selected, that channels sequence will be disabled.<br>Controlled by Digiphase |
| DTx mode on/off | 1 | [1] [2] [↷] x [↷] | Toggles DTx on/off:<br>x = 0, DTx mode off<br>x = 1, DTx mode on<br>Controlled by CIE & SP |
| Change transmit power level | 2 | [2] [0] [↷]<br>(x) x [↷] | Set the power level:<br>xx = power level (max.), 5-15<br>PL5 = 33 dBm PL11 = 21 dBm<br>PL6 = 31 dBm PL12 = 19 dBm<br>PL7 = 29 dBm PL13 = 17 dBm<br>PL8 = 27 dBm PL14 = 15 dBm<br>PL9 = 25 dBm PL15 = 13 dBm<br>PL10 = 23 dBm<br>Controlled by ANA |
| Carrier on/off | 2 | [2] [1] [↷] x [↷] | Turn the transmitter on/off:<br>x = 0, transmitter off<br>x = 1, transmitter on<br>Controlled by PA gating, from TC |
| Modulator on/off | 2 | [2] [2] [↷] x [↷] | Turn the modulator on/off:<br>x = 0, modulator off<br>x = 1, modulator on<br>Controlled by MOD-EN, from TC |
| Tx-data | 2 | [2] [3] [↷] x [↷] | Send modulation data:<br>x = 0, stop sending data<br>x = 1, send Tx random data |
| Timebase tracking | 2 | [2] [4] [↷] x [↷] | Change the current timeslot position by advancing/retarding by intervals of 1 timeslot:<br>x = 0, advance 1 timeslot<br>x = 1, delay 1 timeslot<br>Controlled by TC |
| Doppler tracking | 2 | [2] [5] [↷]<br>(x) (x) x [↷] | Calibrate 13 MHz VCX0.<br>Enables the reference frequency to be accurately adjusted, by using 256 incremental steps to compensate for doppler effect.<br>xxx = 0 - 255 (DAC value)<br>Controlled by ANA |
| Measure RSSI | 3 | [3] [0] [↷]<br>(x) (x) x [↷] | Measures RSSI on specified channel:<br>xxx = channel 1 to channel 124<br>The display will show:<br>xxx yyy dBm<br>where xxx = channel number<br>yyy = RSSI |

**Table 7.1 Test Commands (cont'd)**

| COMMAND | GROUP | KEY OPERATION | FUNCTION |
|---|---|---|---|
| Set AGC | 3 | 3 1 ↷ x ↷ | Set AGC gain:<br>x = 0, Automatic gain control<br>x = 1, 0 dB<br>x = 2, 8 dB<br>x = 3, 16 dB<br>x = 4, 24 dB<br>x = 5, 32 dB<br>x = 6, 40 dB<br>x = 7, 48 dB<br>x = 8, 56 dB. Controlled by ANA<br>NB: Monitor window should be opened at the same time. |
| DTMF on | 4 | 4 0 ↷ x ↷ | Control Speech Processor tones.<br>Activate the DTMF generator with the tones associated with the keycode requested.<br>Apply DTMF signal to the modulator and DTMF sidetone to the receive audio line.<br>x = telephone line<br><br>Key Assigned Frequencies<br>x = 1, 1209 Hz & 697 Hz<br>x = 2, 1336 Hz & 697 Hz<br>x = 3, 1477 Hz & 697 Hz<br>x = 4, 1209 Hz & 770 Hz<br>x = 5, 1336 Hz & 770 Hz<br>x = 6, 1477 Hz & 770 Hz<br>x = 7, 1209 Hz & 852 Hz<br>x = 8, 1336 Hz & 852 Hz<br>x = 9, 1477 Hz & 852 Hz<br>x = *, 1209 Hz & 941 Hz<br>x = 0, 1336 Hz & 941 Hz<br>x = #, 1477 Hz & 941 Hz<br>Controlled by SP |
| DTMF off | 4 | 4 1 ↷ | Control Speech Processor tones.<br>Deactivate the DTMF generator.<br>Controlled by SP. |
| Control single tones | 4 | 4 2 ↷ x ↷ | Activate/Deactivate the following single tones:<br>x = 0, silence<br>x = 1, dial tone<br>x = 2, subscriber busy<br>x = 3, congestion<br>x = 4, radio path acknowledgement<br>x = 5, radio path not available<br>x = 6, error/special information<br>x = 7, ringing tone<br>x = 8, call waiting tone<br>x = 9, alert tone<br>x = 10, beep tone<br>Controlled by SP |

**Table 7.1 Test Commands (cont'd)**

| COMMAND | GROUP | KEY OPERATION | FUNCTION |
|---|---|---|---|
| Speech processor loopback test | 4 | 4 3 ↷ x ↷ | Loopback test:<br>x = 0, Stop loopback test<br>x = 1, ANLP (Analogue audio loopback)<br>x = 2, DIGLP (Digital audio loopback)<br>x = 3, DTLP (Data loopback)<br>x = 4, LOOPTEST (self test function)<br>x = 5, EO/DI (select between encoder data O/P and decoder data I/P)<br>x = 7, SLR RLR (sending/receiving loudness rating test)<br>Controlled by CIE & SP |
| Rx/Tx mute/ unmute | 4 | 4 4 ↷ x ↷ | Mute/Unmute the Rx-audio or Tx-audio<br>x = 0, Rx unmute<br>x = 1, Rx mute<br>x = 3, Tx unmute<br>x = 4, Tx mute |
| Path control | 4 | 4 5 ↷ x ↷ | Path select<br>x = 0, Select microphone (external)<br>x = 1, Select microphone (external) and speaker (external)<br>x = 2, Select microphone (internal) and speaker (buzzer)<br>x = 3, Select microphone (internal) and speaker (internal)<br>x = 4, Set normal gain<br>x = 5, Increase gain |
| Volume control | 4 | 4 6 ↷ x ↷<br>(y) (y) y ↷ | Tone or received speech volume control.<br>x = 0, volume of tone<br>x = 1, volume of received speech<br>(y) y = 0, (tone: 0dB, voice +12 dB)<br>(y) y = 1, (tone: -1 dB, voice +11 dB)<br>:<br>:<br>(y) y = 30, (tone: -30 dB, voice -18 dB)<br>(y) y = 31, tone -31 dB, voice -19 dB)<br>The selected volume level will be displayed. |
| Current control | 4 | 4 7 ↷ (x) ↷<br>y ↷ | Buzzer volume control.<br>x = 0, volume of tone<br>x = 1, volume of received speech<br>y = 0, quiet<br>y = 1,<br>y = 2,<br>y = 3,<br>y = 4, loud |
| Version | 5 | 5 0 ↷ | Display the ROM version on the LCD:<br>x x x x x x y<br>z z z z<br>where: xxxxxx = software version<br>y = pcb version<br>zzzz = EPROM checksum |
| IMEI | 5 | 5 1 ↷ | Display the IMEI. |

**Table 7.1 TestT Commands (cont'd)**

| COMMAND | GROUP | KEY OPERATION | FUNCTION |
|---|---|---|---|
| IMSI | 5 | [5] [2] [↷]<br>(x) (x) (x) (x) xxxx [↷] | Display the IMSI.<br>(x) (x) (x) (x) xxxx = PIN |
| Product number | 5 | [5] [3] [↷] | Displays the production serial number |
| Program MCN data | 5 | [5] [4] [↷] x [↷]<br>yyyyyy [↷] | Program MCN data to the EPROM<br>x = 1 - 5, MCN number<br>y = 0 - 9, MCN data |
| Get MCN data | 5 | [5] [5] [↷] x [↷] | Display MCN data on the LCD<br>x = 1 - 5, MCN number<br>The MCN data will be displayed. |
| Get ADC data | 6 | [6] [0] [↷] | Display battery voltage and temperature.<br>V1 = Battery voltage in HEX<br>V2 = Battery temperature in HEX |
| Peripheral control | 6 | [6] [1] [↷] x [↷] | Control peripheral devices through the serial interface.<br>x = 0, Handsfree initialisation<br>x = 1, Handsfree software version request<br>x = 2, Handsfree transmission inhibit<br>x = 3, Handsfree transmission permit<br>x = 4, Radio mute on<br>x = 5, Radio mute off<br>x = 6, Centre volume set<br>x = 7, Carrier on<br>x = 8, Carrier off<br>x = 9, Handsfree audio control |
| Status | 6 | [6] [2] [↷] | Display the mobile status:<br>Note: All data is displayed in HEX.<br>xx xx xx xx xx xx xx xx xx<br>Miscellaneous (2)<br>Miscellaneous (1)<br>AGC setting<br>AFC setting<br>Timeslot<br>Power level<br>Monitor channel No.<br>Tx channel No.<br>Rx channel No.<br>Miscellaneous (1):<br>bit 0 = Modulator on (1), or off (0)<br>bit 1 = DTx mode on (1), or off (0)<br>bit 2 = Rx mute (1), or unmute (0)<br>bit 3 = Tx mute (1), or unmute (0)<br>bit 4 = External (1), or internal (0) power<br>bit 5 = Handsfree present (1), absent (0)<br>bit 6 = Booster present (1) or absent (0)<br>bit 7 = On hook (1), or off hook (0) |

**Table 7.1 Test Commands (cont'd)**

| COMMAND | GROUP | KEY OPERATION | FUNCTION |
|---|---|---|---|
| Status (contued) | 6 | | Miscellaneous (2):<br>bit 0-1 = Battery ID (NiCd = 0, NiMH = 1, Cigar lighter = 2)<br>bit 2 = Logic power on (1) or off (0)<br>bit 3 = ANA sleep on (1) or off (0)<br>bit 4 = Booster disable on (1), or off (0)<br>bit 5 = Under voltage reset interrupt status enabled (1) or disabled (0)<br>bit 6 = Sp sleep on (1) or off (0)<br>bit 7 = Not used<br><br>AGC setting:<br>00 hex: Automatic gain control<br>01 hex: 0 dB<br>02 hex: 8 dB<br>03 hex: 16 dB<br>04 hex: 24 dB<br>05 hex: 32 dB<br>06 hex: 40 dB<br>07 hex: 48 dB<br>08 hex: 56 dB |
| Backlight control | 6 | 6 3 x | Backlight ON/OFF and backlight colour control<br>x = 0, backlight off<br>x = 1, backlight colour green<br>x = 2, backlight colour amber |
| Get key code | 6 | 6 4 x | Output key code from serial port.<br>Whilst this function is active, the KEY CODE command is output from the serial port on every key operation. The power key is disabled.<br>x = 0, stop output of key code<br>x = 1, start output pof key code |
| Discrete output | 6 | 6 5 (x) x | Discrete output control.<br>x = 0: Logic power off<br>x = 1: Logic power on<br>x = 2: ANA sleep off<br>x = 3: ANA sleep on<br>x = 4: ANA sleep normal<br>x = 5: Booster disable off<br>x = 6: Booster disable on<br>x = 7: Under voltage reset int. enable<br>x = 8: Under voltage reset int. disable<br>x = 9: Under voltage reset int. normal<br>x = 10: SP sleep off<br>x = 11: SP sleep on |
| Check LCD | 6 | 6 6 x | Display LCD patterns on the LCD<br>x = 0: Disable check pattern 1<br>x = 1: Display check pattern 2 |
| Control dummy SIM | 6 | 6 7 x | Enable/disable dummy SIM function.<br>x = 0, Disable dummy SIM<br>x = 1, Enable dummy SIM |

**Table 7.1 Test Commands (cont'd)**

| COMMAND | GROUP | KEY OPERATION | FUNCTION |
|---|---|---|---|
| Program handsfree electric volume data | 6 | [6] [8] [↷] (x) x [↷]<br>y1y1y1 y2y2y2 y3y3y3 [↷] | Program handsfree electric data to the EEPROM.<br>x = 0-17: Country data<br><br>0 = Default 9 = Greek<br>1 = Austrian 10 = Italian<br>2 = Belgian 11 = Norwegian<br>3 = Danish 12 = Portuguese<br>4 = Dutch 13 = Spanish<br>5 = English 14 = Swedish<br>6 = Finnish 15 = Country 1<br>7 = French 16 = Country 2<br>8 = German 17 = Country 3<br>y1y1y1 = 001 - 129: Tx Data<br>y2y2y2 = 001 - 129: Rx1 Data<br>y3y3y3 = 001 - 129: Rx2 Data |
| Get handsfree electric volume data | 6 | [6] [9] [↷] (x) x [↷] | Get handsfree electric data to the EEPROM.<br>x = 0-17: Country data<br><br>0 = Default 9 = Greek<br>1 = Austrian 10 = Italian<br>2 = Belgian 11 = Norwegian<br>3 = Danish 12 = Portuguese<br>4 = Dutch 13 = Spanish<br>5 = English 14 = Swedish<br>6 = Finnish 15 = Country 1<br>7 = French 16 = Country 2<br>8 = German 17 = Country 3<br><br>The display will show: xxx yyy zzz<br><br>Where: xxx = 001 - 129: Tx Data<br>yyy = 001 - 129: Rx1 Data<br>zzz = 001 - 129: Rx2 Data |
| Show lock condition | 7 | [7] [0] [↷] | Displays mobile lock condition:<br>PART LOCK (Partial lock)<br>FULL LOCK (Full lock)<br>UN LOCK (Unlocked). Also displays the lock code |
| Select lock level | 7 | [7] [1] [↷] x [↷] | x = 0, Unlock<br>x = 1, Part lock<br>x = 2, Full lock |
| Change lock code | 7 | [7] [2] [↷] xxxx [↷] | xxxx = new lock code |
| Get mobile data | 7 | [7] [3] [↷] xy [↷] | Read system data stored in EPROM.<br>x = 0, y = 0: Display NiCd battery voltage<br>x = 0, y = 1: Display NiMH battery voltage<br>x = 0, y = 2: Battery temperature data from ADC<br>x = 1, y = 3: AFC Mode |

**Table 7.1 Test Commands (cont'd)**

| COMMAND | GROUP | KEY OPERATION | FUNCTION |
|---|---|---|---|
| Programme mobile data | 7 | 7 4 ↷ xy ↷<br>(z) (z) z ↷ | Program system data to the EPROM.<br>x = 0, y = 0: Enter NiCd battery voltage<br>x = 0, y = 1: Enter NiMH battery voltage<br>x = 0, y = 2: Enter battery temperature data<br>x = 1, y = 3: AFC Mode<br>(z) (z) z = data |
| Show handset test enable flag | 8 | 8 0 ↷ | Show handset enable flag |
| Set/reset handset test enable flag | 8 | 8 1 ↷ x ↷ | Handset test on/off<br>x = 0, Disable handset test mode<br>x = 1, Enable handset test mode |
| Show error code display flag | 8 | 8 2 ↷ | Show error code display flag |
| Set/reset error code display flag | 8 | 8 3 ↷ x ↷ | Set/reset error code display flag<br>x = 0, no error code displayed<br>x = 1, error code displayed |
| Show monitor mode | 8 | 8 4 ↷ | The current monitor mode will be displayed:<br>MODE 0: Monitor mode not available<br>MODE 1: Monitor mode 1<br>MODE 2: Monitor mode 2<br>MODE 3: Monitor mode 3<br>MODE 4: Monitor mode 4 |
| Select monitor mode | 8 | 8 5 ↷ x ↷ | Select monitor mode<br>x = 0: Disable monitor mode<br>x = 1: Monitor mode 1<br>x = 2: Monitor mode 2<br>x = 3: Monitor mode 3<br>x = 4: Monitor mode 4 |

## 7.4 HANDPORTABLE ERROR CODES

If an error is detected, the HPU enters error mode and an error code is displayed on the LCD. In this mode, only the key is available.

| Error code | Description |
|---|---|
| 01 | EPROM checksum error |
| 02 | EEPROM checksum error |
| 03 | No IMEI |
| 04 | EEPROM write verify error |
| 05 | TIM |
| 06 | ANA |
| 07 | CIE RAM |
| 08 | Handsfree audio |
| 09 | Booster |
| 10 | Software error |

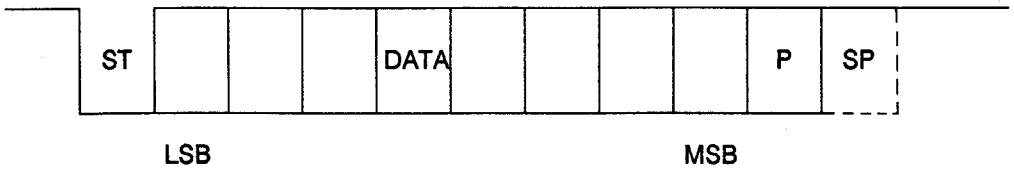
## 7.5 SERIAL INTERFACE

Data is transmitted and received via a full duplex asynchronous transmission at 9,600bit/second, between the micro controller in the handportable unit and peripheral devices, using the serial interface.

### 7.5.1 Data Format

(1) Frame format

Each frame consists of 11 bits. Both downward serial data (main CPU to peripheral device) and upward serial data (peripheral device to main CPU) are transmitted using the same format.




ST : Start Mark ( = 0)
DATA : Data. Data is sent from LSB (Least Significant Bit)first.
P : Parity (Even Parity)
SP : Stop Mark (=1)

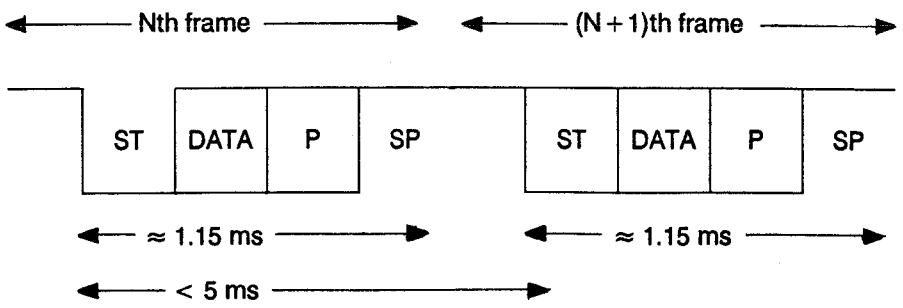
(2) Command format

Commands consists of multiple frames; 4 frames minimum, 258 frames. The DATA part of each frame in a command is defined as follows:

| | |
|---|---|
| Start Byte (=00H) | 1st Frame |
| Command ID | 2nd Frame |
| Data Length | 3rd Frame |
| Data 1 | 4th Frame |
| Data 2 | 5th Frame |
| ⋮ | ⋮ |
| Data N | (N + 3) th Frame |

The Data Length shall take the value of 1 to 255 inclusive.

Note: The interval between any two consecutive frames in a command must be such that the transmission of the ST mark of a frame must be started within 5ms of the start of the transmission of ST mark of the previous frame.



### 7.5.2 Data Transmission Protocol

The handshake process is not generally required so that both the main CPU and peripheral devices can transmit their commands at any time. The exceptions to this rule are:

- The peripheral device must not transmit any command for a period of 50 ms after a POLLING command is received.
- Some peripheral devices are required to use a different handshake procedure in order to transmit a command.

i) The peripheral device shall transmit the TRANSMISSION REQUEST command to the main CPU.

ii) If the TRANSMISSION REQUEST ACKNOWLEDGEMENT command is received from the main CPU, the peripheral device must start the transmission of a command within 50 ms and finish the transmission within 350 ms of receipt of transmission request acknowledgement.

The peripheral device can transmit only one command during this period.

iii) If the TRANSMISSION REQUEST ACKNOWLEDGEMENT command is not received from the main CPU within 350 ms, the peripheral device can transmit a TRANSMISSION REQUEST command to the main CPU again. However it must be within 400 ms of the previous transmission of TRANSMISSION REQUEST.

Notes: 1. If the peripheral device receives a POLLING command whilst it is transmitting a command, it will transmit the latter frames of the command.

2. Peripheral devices whose transmitting command consists of only four frames, and the test set, are not required to use the handshake process.

### 7.5.3 Operation Process

#### 7.5.3.1 Serial interface initialization

The main CPU transmits the INITIALIZATION command, and then receives the INITIALIZATION ACKNOWLEDGEMENT command, from each peripheral device. It can therefore determine whether or not a peripheral device is connected. The main CPU performs this initialization process as follows:

The main CPU transmits the INITIALIZATION command to the handsfree cradle. The handsfree CPU transmits the INITIALIZATION ACKNOWLEDGEMENT command, finishing the transmission within 20 ms of receiving the fourth frame of the INITIALIZATION command.

The handsfree CPU uses the INITIALIZATION ACKNOWLEDGEMENT command to inform the main CPU whether the power booster is connected or not.

If necessary, the main CPU transmits the INITIALIZATION command to the other peripheral devices, which also transmit the INITIALIZATION ACKNOWLEDGEMENT command, finishing the transmission within 20 ms of receiving the fourth frame of the INITIALIZATION command.

Note: The peripheral device must not transmit any command, other than the INITIALIZATION ACKNOWLEDGEMENT command, for 500 ms after it receives the INITIALIZATION command from the main CPU.

The peripheral device which does not expect to receive an INITIALIZATION command must not transmit any command for 2 seconds after power on unless it receives a command from the main CPU.

### 7.5.3.2 Normal Process

Following serial interface initialization, the following processes are executed by the CPUs.

(1) Main CPU process:

The main CPU generates its own timing for transmitting a command on the downward serial interface. When the main CPU transmits the TRANSMISSION REQUEST ACKNOWLEDGEMENT command to the peripheral device, it sets a 400 ms timer.

(2) The handsfree cradle process:

The handsfree cradle does not transmit any command except the INITIALIZATION ACKNOWLEDGEMENT command.

(3) The test set process:

The test set generates its own timing for transmitting a command.

### 7.5.3.3 Error process

Two types of error may occur on the serial interface, the parity error and the framing error. If either of these errors are detected, the receiving side of the serial interface will lose the data frames already received. It must then wait for another Start Byte frame.

If a command is received correctly, but is unrecognizable, it will be ignored.

### 7.5.3.4 Command synchronization

The transmitting side of the serial interface generates its own timing for transmitting a command.

The receiving side of the serial interface will synchronize as follows:

(1) If the 00H data is received when no command is being received, it should be recognized as the Start Byte frame and the command synchronization is acquired. Otherwise, the data frame will be ignored.

(2) If the data, except 00H data, is received within 5 ms of the Start Byte frame, it will be recognized as the Command ID frame. Otherwise, the command synchronization will be lost and another Start Byte frame should be expected.

(3) If the data, except 00H data, is received within 5ms after the Command ID frame it will be recognized as the Data Length frame. Otherwise, the command synchronization will be lost.

(4) If no data is received within 5 ms of the command synchronization, the command synchronization will be lost.

## 7.5.4 Serial Command List

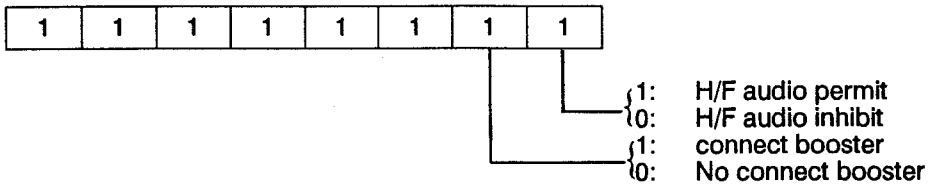
The upward serial command usually consists of four frames, the Start frame (=00H), Command ID, Data length (=1) and data 1 (= transaction code).

Some of the peripherals, or testsets, may transmit a 5 frame command in order to transmit additional data bytes following the transaction code.

### 7.5.4.1 Commands

(1) INITIALIZATION ACK. (Upward command)

Transmitted by the handsfree CPU when it receives the INITIALIZATION command. The second data byte of this command is:




(2) H/F SOFT VERSION ACK. (Upward command)

Transmitted by the handsfree when it receives the H/F SOFT VERSION REQ. command.

The second data byte of this command is handsfree software version (01 to FFH). The third data byte of this command is same as the second data byte of INITIALIZATION ACK. command.

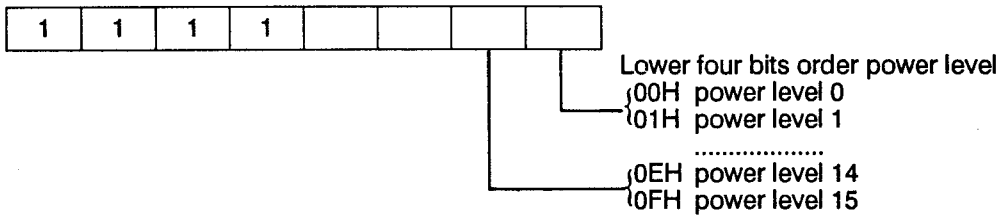
(3) CENTRE VOLUME SET (Downward command)

Indicates the centre volume value of the handsfree electric volume. The handsfree can change the audio-gain of the electric volume, which is country specific.

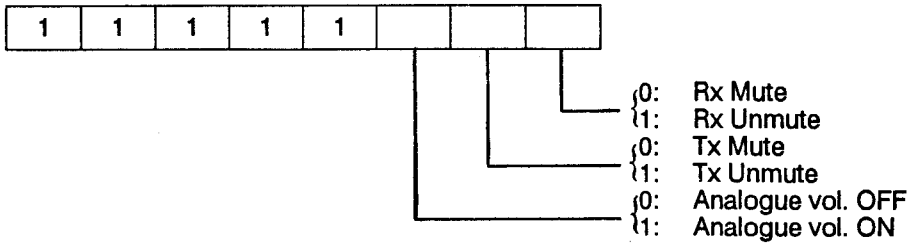
The second data byte of this command is Tx volume value. The third data byte of this command is Rx1 volume value and the fourth data byte of this command is Rx2 volume value.

(4) CARRIER ON WITH P.L. (Downward command)

The CARRIER ON/OFF port is switched ON and the PL0 ~ PL3 port is set by decoding the second data byte of the command. The second data byte of this command is:




(5) H/F AUDIO CONTROL (Downward command)
This command indicates handsfree audio path control. Analog volume ON/OFF and Mute/Unmute are decided by this command. The second data byte of this command is shown as follows:



### 7.5.4.1 Command IDs

Downward Serial Command (Main CPU to Handsfree CPU)

| Command ID | Data 1 (= Tr. Code) | Data Length | Command Name | Remark |
|---|---|---|---|---|
| 08H Handsfree CPU | 00H | | | |
| | 01H | 1 | Initialization | |
| | 02H | | | |
| | 03H | | | |
| | 04H | | | |
| | 05H | | | |
| | 06H | | | |
| | 07H | | | |
| | 08H | | | |
| | 09H | | | |
| | 0AH | | | |
| | 0BH | | | |
| | 0CH | | | |
| | 0DH | | | |
| | 0EH | | | |
| | 0FH | | | |
| | 10H | 1 | H/F Soft Version Req. | |
| | 11H | | | |
| | 12H | | | |
| | 13H | | | |
| | 14H | | | |
| | 15H | | | |
| | 17H | | | |
| | 18H | | | |
| | 19H | | | |
| | 1AH | | | |
| | 1BH | | | |
| | 1CH | | | |
| | 1DH | | | |
| | 1EH | | | |
| | 1FH | | | |
| | 20H | | | |
| | 21H | | | |
| | 22H | | | |
| | 23H | | | |
| | 24H | | | |
| | 25H | | | |
| | 26H | | | |
| | 27H | | | |
| | 28H | | | |
| | 29H | | | |
| | 1AH | | | |
| | 2BH | | | |
| | 2CH | | | |
| | 2DH | | | |
| | 2EH | | | |
| | 2FH | | | |

Downward Serial Command (Main CPU to Handsfree CPU) (continued)

| Command ID | Data 1 (= Tr. Code) | Data Length | Command Name | Remark |
|---|---|---|---|---|
| 08H | 30H | 1 | H/F Transmission Inhibit | |
| Handsfree | 31H | 1 | H/F Transmission Permit | |
| CPU | 32H | 1 | Horn Alert ON | |
| | 33H | 1 | Horn Alert OFF | |
| | 34H | 1 | Radio Mute ON | |
| | 35H | 1 | Radio Mute OFF | |
| | 36H | 4 | Centre Volume Set | (Note 1) |
| | 37H | | | |
| | 38H | | | |
| | 39H | | | |
| | 3AH | 2 | Carrier ON with P.L. | (Note 2) |
| | 3BH | 1 | Carrier OFF | |
| | 3CH | 2 | H/F Audio Control | (Note 3) |
| | 3DH | | | |
| | 3EH | | | |
| | 3FH | | | |

Notes:1. The second, third and fourth data byte of the CENTRE VOLUME SET command indicate the centre value of electric volume (Tx, Rx1, Rx2).

2. The second data byte of the CARRIER ON WITH P.L. command indicates Tx power level for power booster.

3. The second data byte of H/F AUDIO CONTROL command indicates H/F audio path selection and mute or unmute.

FOR REFERENCE ONLY

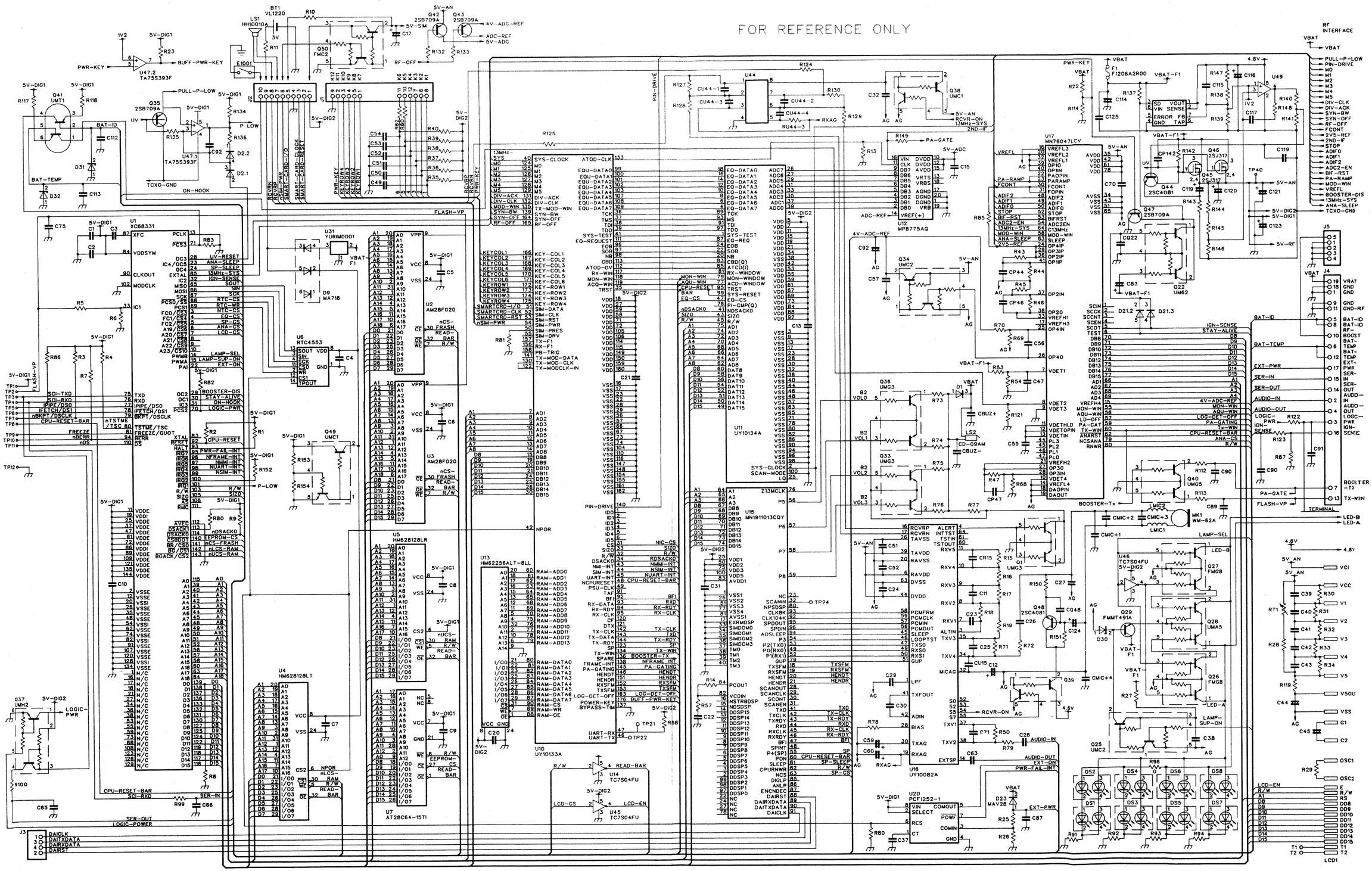


**Figure 8.2 Handportable overview - circuit diagram**

# 8. CIRCUIT DIAGRAMS

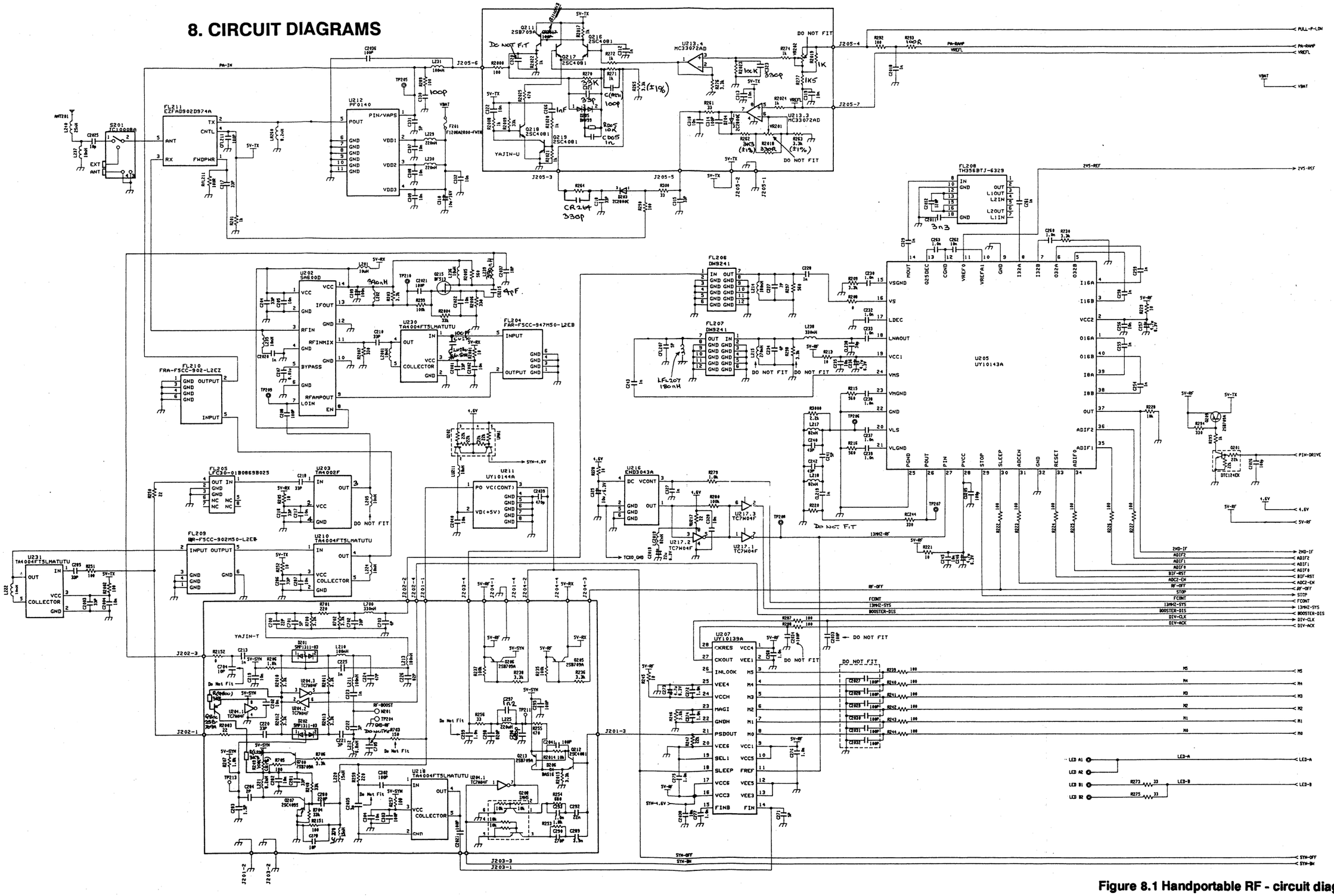



**Figure 8.1 Handportable RF - circuit diagram**

# G2 MICROPROCESSOR

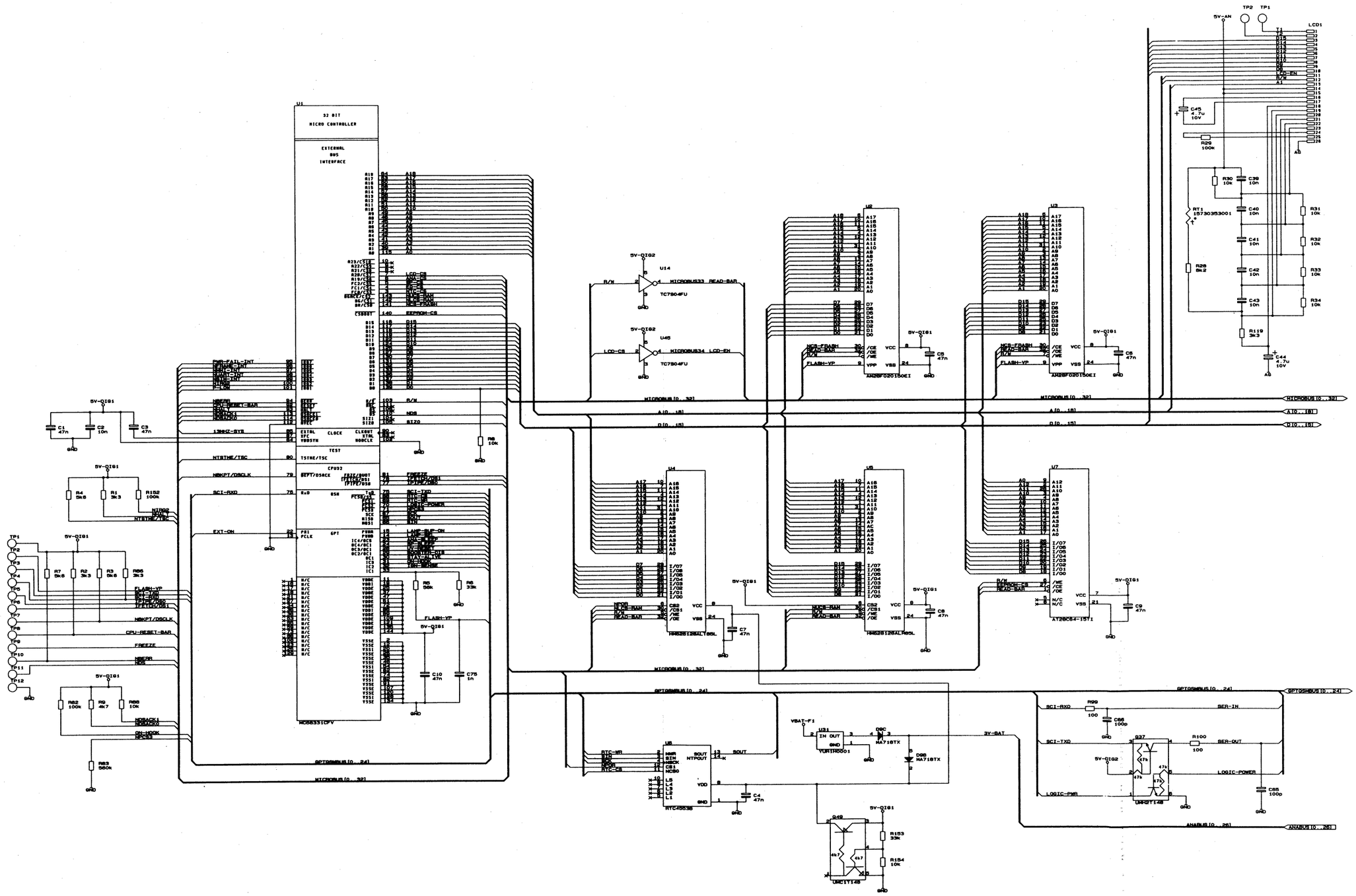



**Figure 8.4 Handportable detailed, Microprocessor - circuit diagram**

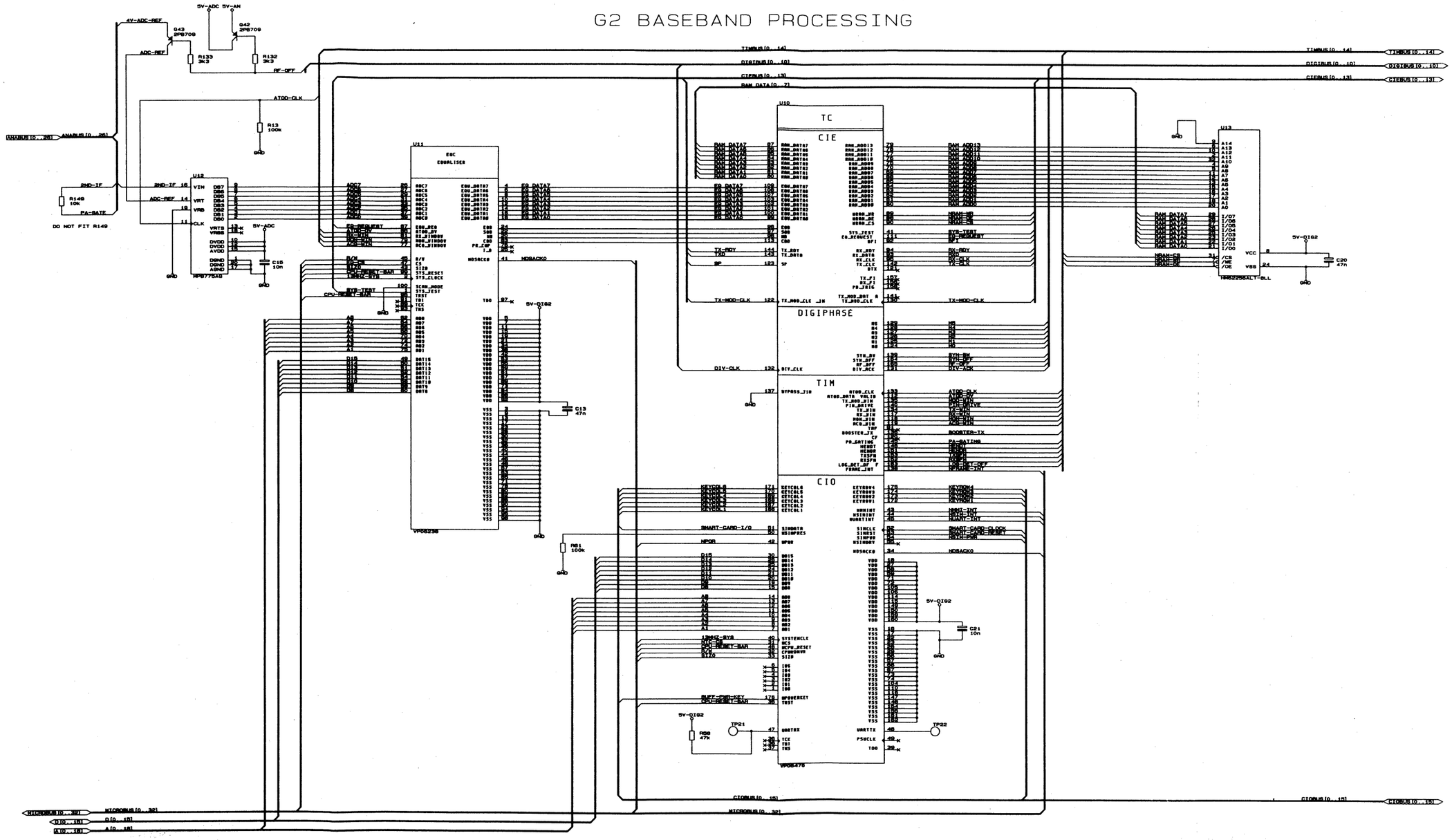



**Figure 8.3 Handportable detailed, Baseband - circuit diagram**

**Figure 8.6 Handportable detailed, Power Supply - circuit diagram**

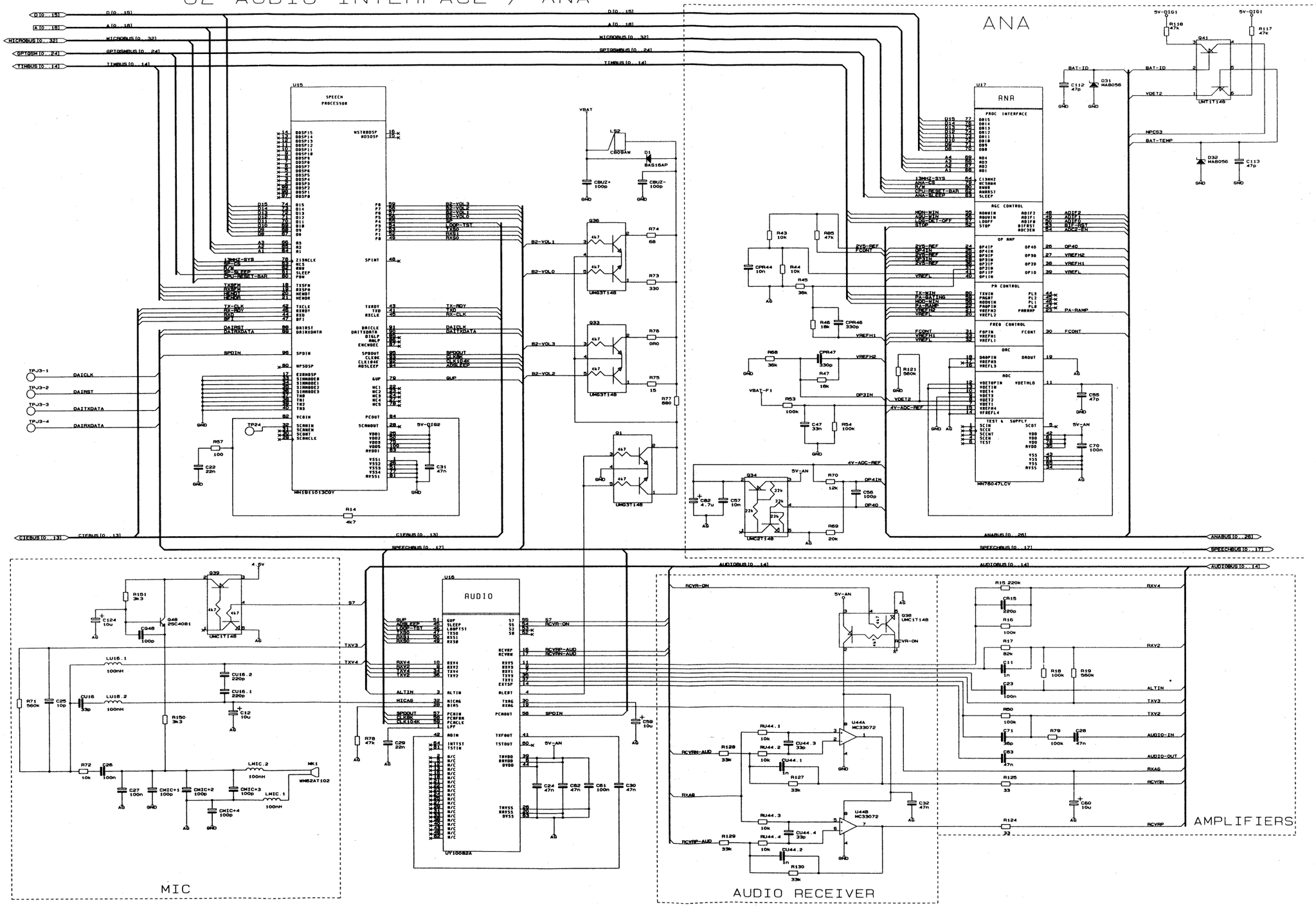
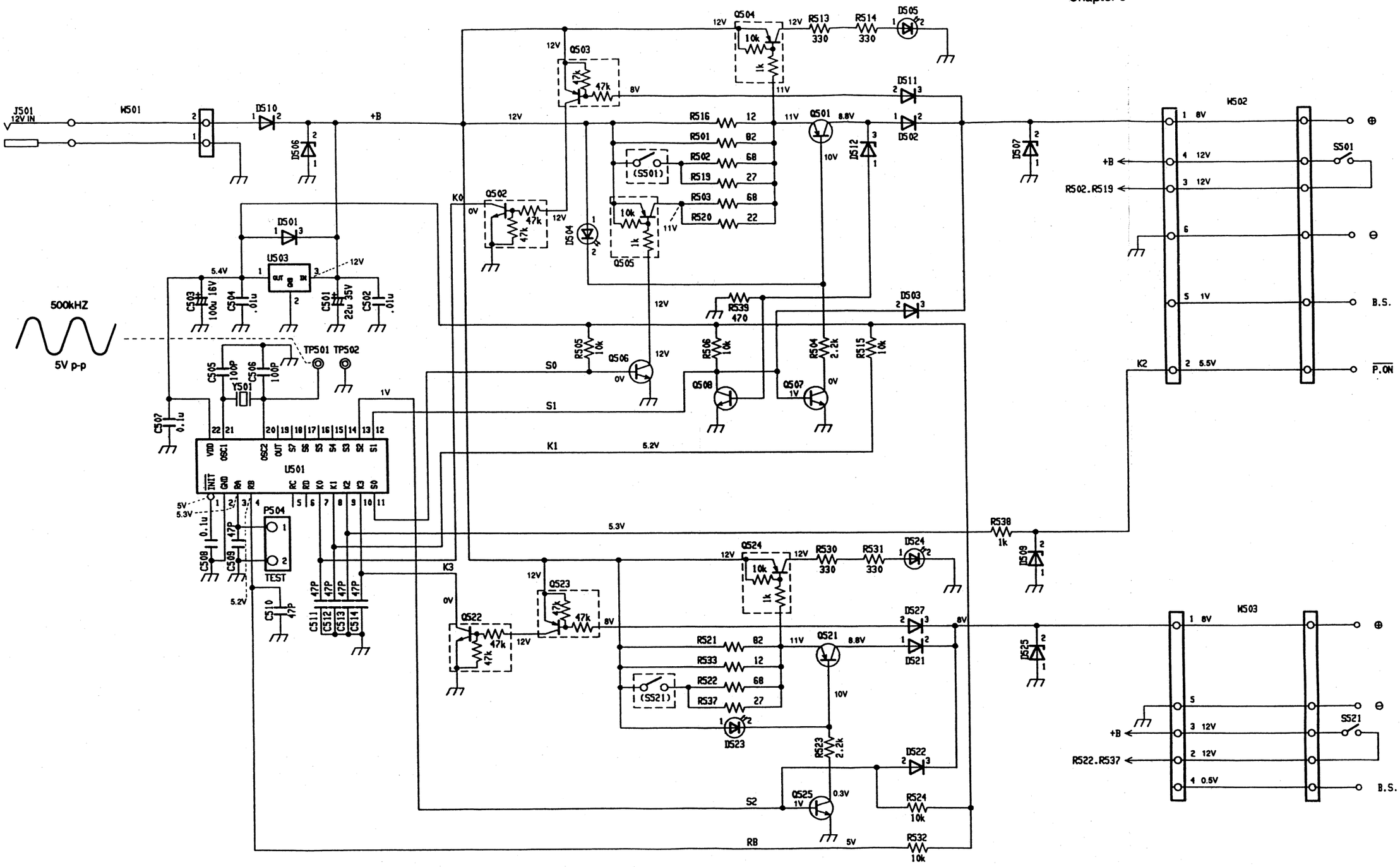



**Figure 8.5 Handportable detailed, Audio Interface and ANA - circuit diagram**




note、R551~591:JUMPER LINEs(0Ω CHIP RESISTORs)

**Figure 8.8 Dual Trickle Charger Unit- circuit diagram**

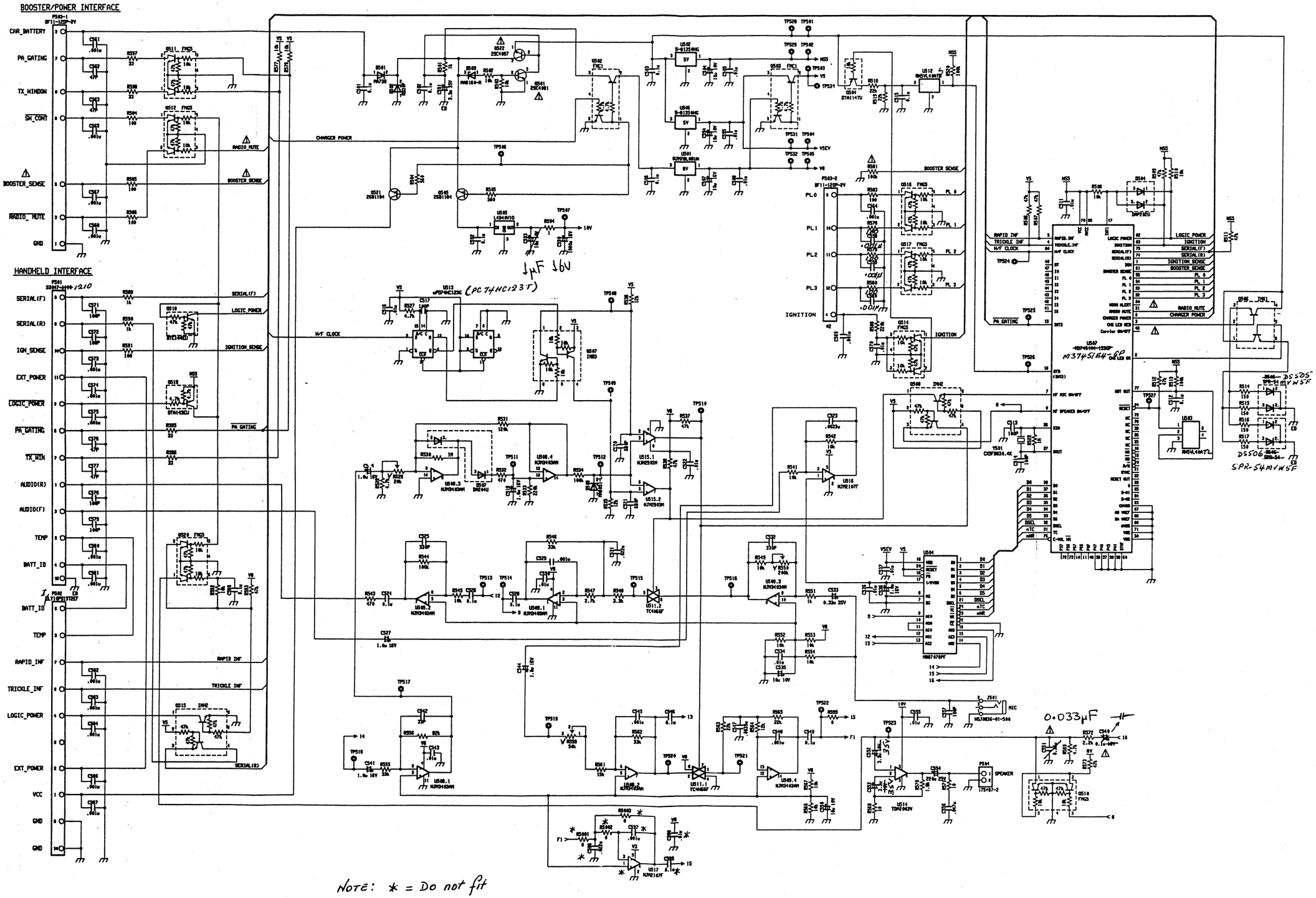



**Figure 8.7 Handsfree Unit - circuit diagram**

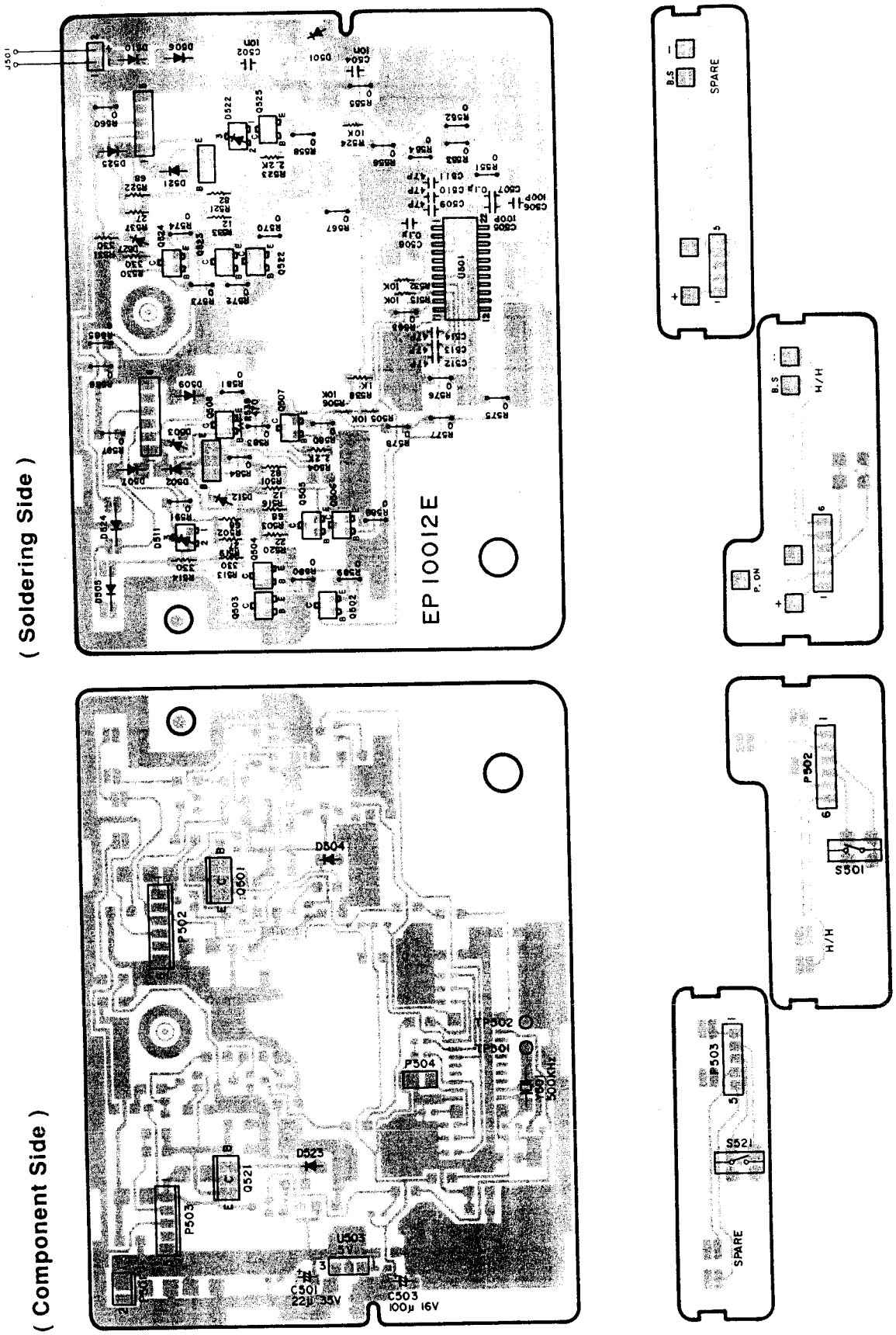
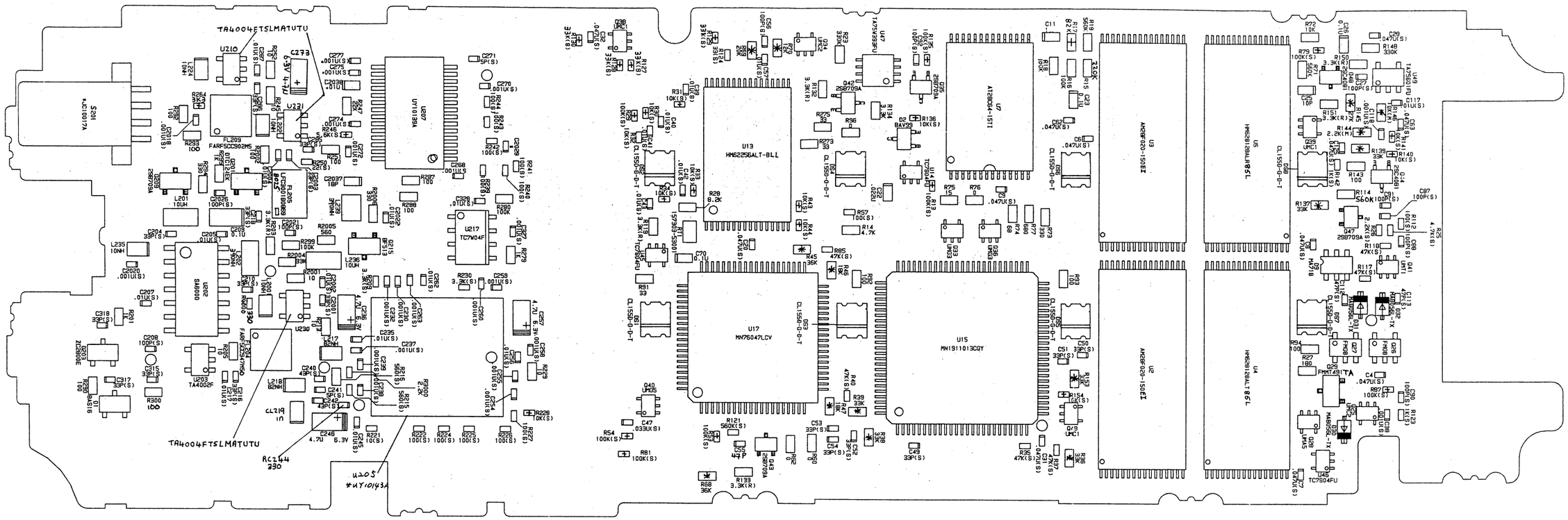



**Figure 9.5 Dual Trickle Charger - component layout (sides 1 and 2)**



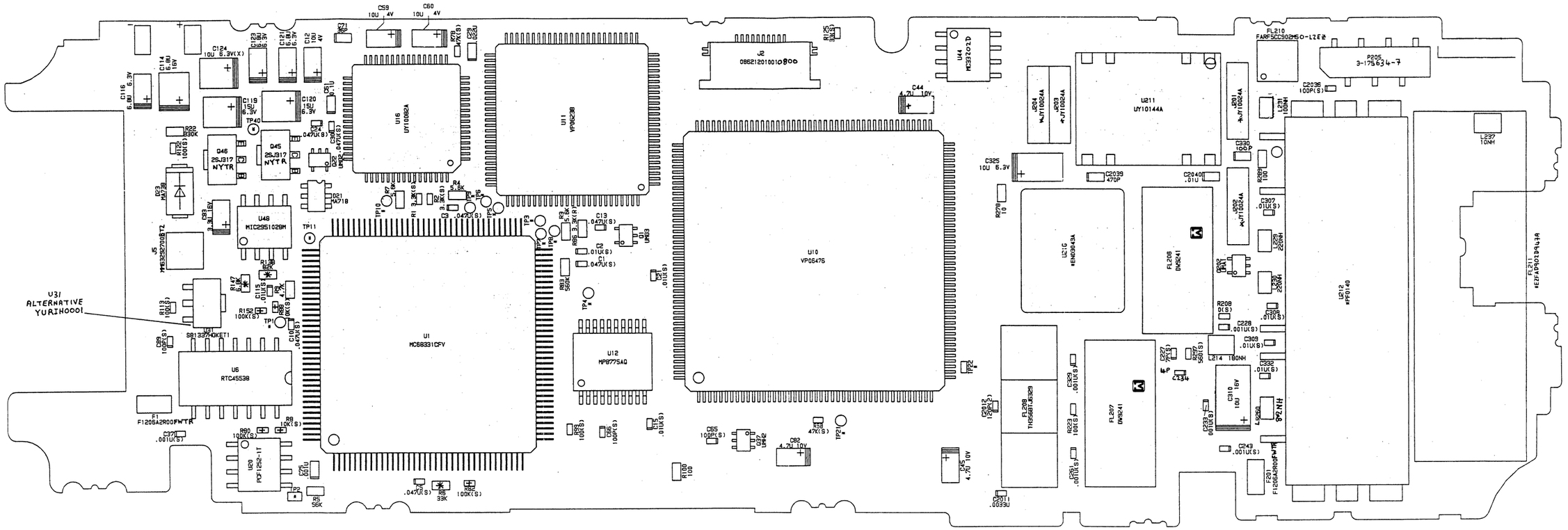

(+) => ±1%
R17
R29
R30
R31
R32
R33
R34
R43
R44
R53
R54
R79
R87
R127
R128
R129
R130
R135
R136
R140
R141
R154
R228
R246
R264
R81

(*) => ±½%
R38
R39
R45
R46
R47
R36
R68
R69
R70
R137
R139
R144
R145
R146
R153
R2004

NOTE: HAND MODIFICATIONS NOT SHOWN.

**Figure 9.2 Handportable - component layout (side 2)**

# 9. PCB LAYOUT DIAGRAMS

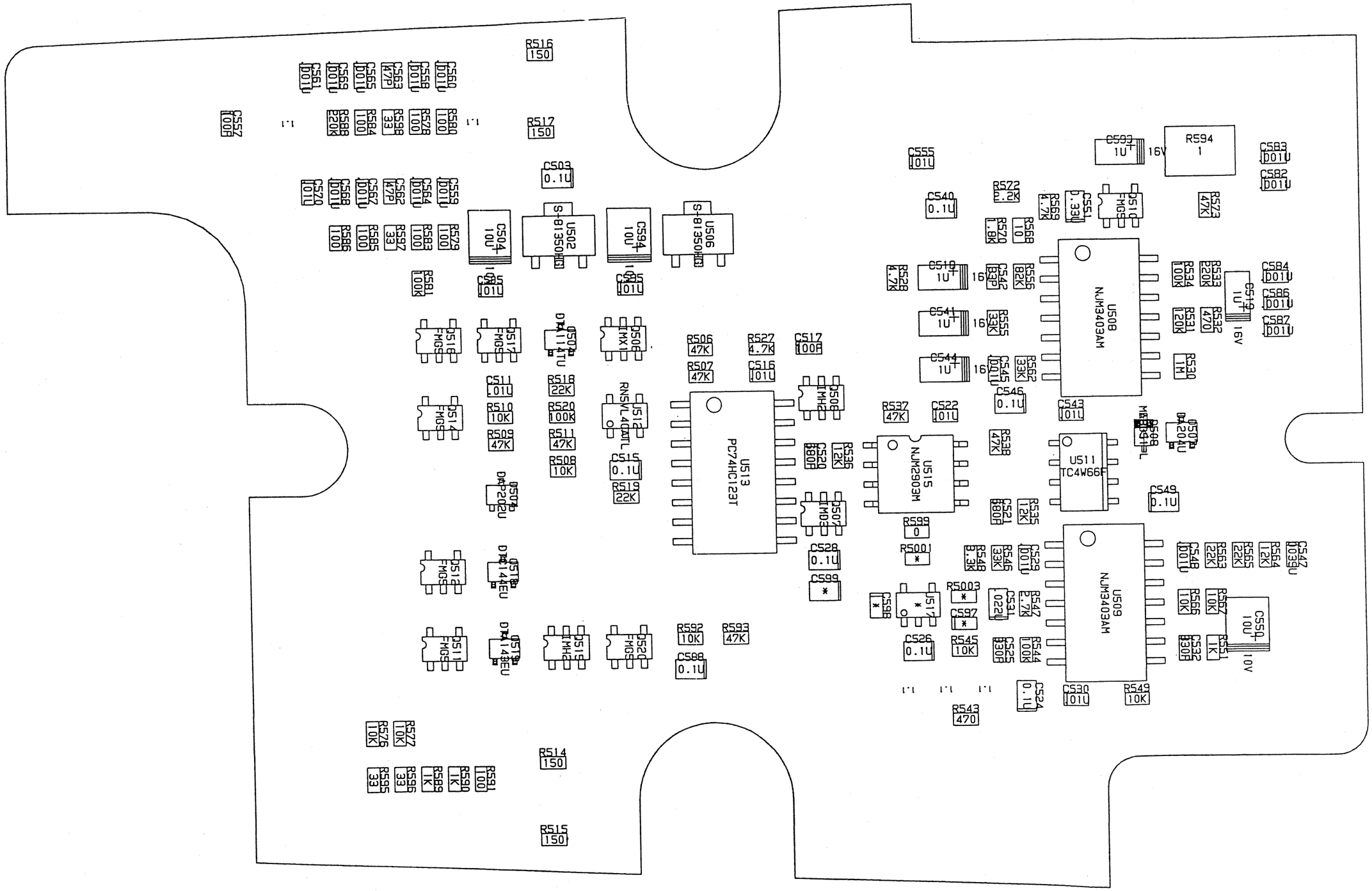



(+) => ±1%
R8
R80
R82
R88
R152

(*) => ±½%
R6
R147
R138

NOTE: HAND MODIFICATIONS NOT SHOWN

**Figure 9.1Handportable - component layout (side 1)**


R516 150
R517 150
R514 150
R515 150
C503 0.1U
C504 10U
C594 10U
U502 S-81350CN
U506 S-81350CN
U513 PC74HC123T
U508 NJM3403AM
U509 NJM3403AM
U515 NJM2903M
U511 TC4W66F
C599 1U 16V
R594 1
C583 D01U
C582 D01U
C584 D01U
C586 D01U
C587 D01U
C585 1U 16V
C550 10U 10V
C547 0.039U
C549 0.1U
C548 D01U
C555 D01U
C540 0.1U
C551 0.33U
C510 FMG5
C519 1U 16V
C542 33P
C541 1U 16V
C544 1U 16V
C545 D01U
C546 0.1U
C543 D01U
C522 D01U
C521 680P
C529 D01U
C528 0.1U
C599 *
C598 *
C597 *
C526 0.1U
C525 330P
C524 0.1U
C530 D01U
C588 0.1U
C559 D01U
C560 D01U
C558 D01U
C565 D01U
C569 D01U
C561 D01U
C557 100P
C564 D01U
C563 47P
C562 47P
C567 D01U
C568 D01U
C570 D01U
C566 D01U
C516 D01U
C517 100P
C511 D01U
C512 D01U
C513 D01U
C514 D01U
C515 0.1U
C518 D01U
C519 D01U
C520 FMG5
C521 FMG5
C522 FMG5
C523 FMG5
C524 FMG5
C525 FMG5
C526 FMG5
C527 FMG5
C528 FMG5
C529 FMG5
C530 FMG5
C531 FMG5
R523 47K
R522 2.2K
R568 10
R569 4.7K
R520 1.8K
R528 4.7K
R556 82K
R555 33K
R562 33K
R545 10K
R544 100K
R543 470
R547 2.7K
R548 3.3K
R546 33K
R549 10K
R550 1K
R551 1K
R552 10K
R553 22K
R554 12K
R555 22K
R556 10K
R557 10K
R558 220K
R559 100
R560 100
R561 100K
R562 100
R563 33
R564 100
R565 220K
R566 100
R567 33
R568 100
R569 100
R570 100
R571 100
R572 100
R573 100
R574 100
R575 100
R576 100
R577 100
R578 100
R579 100
R580 100
R581 100K
R582 100K
R583 100
R584 100
R585 100
R586 100
R587 33
R588 220K
R589 1K
R590 1K
R591 100
R592 10K
R593 47K
R594 47K
R595 33
R596 33
R597 10K
R598 10K
R599 10K
R500 *
R5003 *
R501 4.7K
R502 4.7K
R503 4.7K
R504 4.7K
R505 4.7K
R506 47K
R507 47K
R508 10K
R509 47K
R510 10K
R511 47K
R512 RNSVL4D4TL
R513 RNSVL4D4TL
R514 150
R515 150
R516 150
R517 150
R518 22K
R519 22K
R520 100K
R521 100K
R522 100K
R523 100K
R524 100K
R525 100K
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R527 10K
R528 10K
R529 10K
R530 1M
R531 120K
R532 470
R533 220K
R534 100K
R535 12K
R536 12K
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R536 47

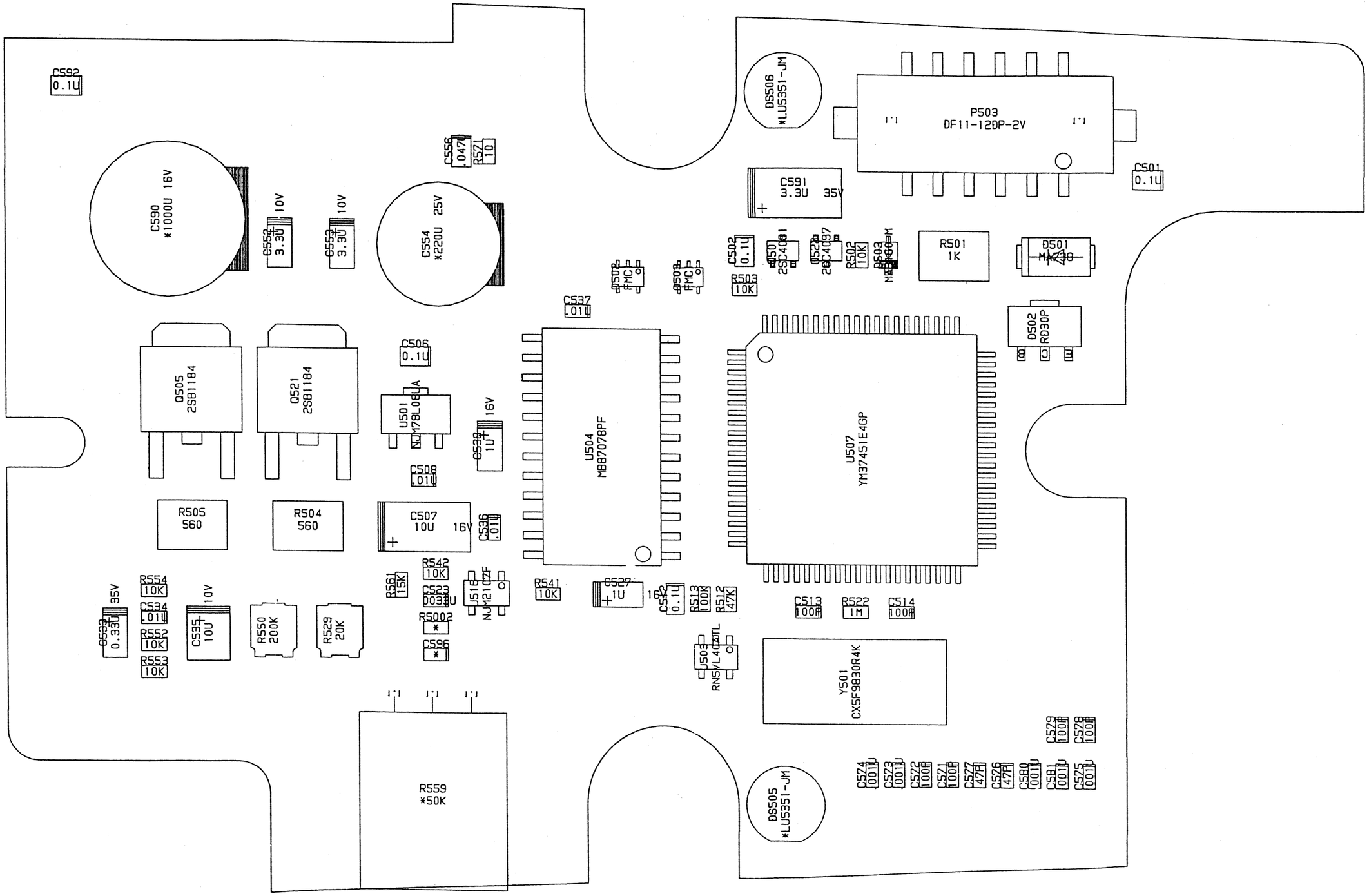


**Figure 9.3 Handsfree - component layout (side 1)**

# 10. PARTS LIST

## 10.1 ELECTRICAL PARTS LIST

### 10.1.1 Main Kit - Detailed Parts List (Circuit Components)

Refer to Chapter 9 for pcb component layout diagrams

| Ref. | Part Number | Description |
|---|---|---|
| BT1 | VL12201FC | BACK-UP BATTERY |
| C1 | GRM36Y5V473Z16 | 47NF CAPACITOR 1005 |
| C10 | GRM36Y5V473Z16 | 47NF CAPACITOR 1005 |
| C11 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C112 | GRM36C0G470J50 | 47PF CAPACITOR 1005 |
| C113 | GRM36C0G470J50 | 47PF CAPACITOR 1005 |
| C114 | ECST1CX685ZR | 6.8U/16V CAPACITOR |
| C115 | GRM36X7R103K16 | 10NF CAPACITOR 1005 |
| C116 | ECST0JY685ZR | 6.8U/6.3V CAPACITOR |
| C117 | GRM36X7R103K16 | 10NF CAPACITOR 1005 |
| C118 | GRM36X7R102J50 | 1NF CAPACITOR 1005 |
| C119 | ECST0JX156ZR | 15U/6.3V CAPACITOR |
| C12 | ECST0GY106ZR | 10U/4V CAPACITOR |
| C120 | ECST0JX156ZR | 15U/6.3V CAPACITOR |
| C121 | ECST0JY685ZR | 6.8U/6.3V CAPACITOR |
| C123 | ECST0JY685ZR | 6.8U/6.3V CAPACITOR |
| C124 | ECST0JX106ZR | 10U/6.3V CAPACITOR |
| C125 | GRM36Y5V473Z16 | 47NF CAPACITOR 1005 |
| C13 | GRM36Y5V473Z16 | 47NF CAPACITOR 1005 |
| C15 | GRM36X7R103K16 | 10NF CAPACITOR 1005 |
| C2 | GRM36X7R103K16 | 10NF CAPACITOR 1005 |
| C20 | GRM36Y5V473Z16 | 47NF CAPACITOR 1005 |
| C2001 | GRM36C0G330J50 | 33PF CAPACITOR 1005 |
| C2002 | GRM36X7R103K16 | 10NF CAPACITOR 1005 |
| C2003 | GRM36C0G330J50 | 33PF CAPACITOR 1005 |
| C2004 | GRM36X7R103K16 | 10NF CAPACITOR 1005 |
| C2011 | GRM36X7R332J50 | 3.3NF CAPACITOR 1005 |
| C2012 | GRM36C0G121J50 | 120PF CAPACITOR 1005 |
| C2018 | GRM36X7R102J50 | 1NF CAPACITOR 1005 |
| C2019* | ECST0JX226ZR | 22U/6.3V CAPACITOR |
| C202 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C2020 | GRM36X7R102J50 | 1NF CAPACITOR 1005 |
| C2021 | GRM36C0G101J50 | 100PF CAPACITOR 1005 |
| C2022 | GRM36X7R103K16 | 10NF CAPACITOR 1005 |
| C2023 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C2026 | GRM36C0G101J50 | 100PF CAPACITOR 1005 |
| C2036 | GRM36C0G101J50 | 100PF CAPACITOR 1005 |
| C2037 | GRM39C0G180J50 | 18PF CAPACITOR 1608 |
| C2038 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C2039 | GRM39C0G471J50 | 470PF CAPACITOR 1608 |
| C204 | GRM36C0G330J50 | 33PF CAPACITOR 1005 |
| C2040 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C2041 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C205 | GRM36X7R103K16 | 10NF CAPACITOR 1005 |
| C207 | GRM36X7R103K16 | 10NF CAPACITOR 1005 |
| C208 | GRM36C0G101J50 | 100PF CAPACITOR 1005 |
| C209 | GRM40Y5V104Z25 | 100NF CAPACITOR |
| C21 | GRM36X7R103K16 | 10NF CAPACITOR 1005 |
| C210 | GRM36C0G330J50 | 33PF CAPACITOR 1005 |
| C213 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C216 | GRM36C0G330J50 | 33PF CAPACITOR 1005 |
| C217 | GRM36X7R103K16 | 10NF CAPACITOR 1005 |
| C218 | GRM36C0G330J50 | 33PF CAPACITOR 1005 |
| C219 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C22 | GRM39X7R223K25 | 22NF CAPACITOR 1608 |
| C220 | GRM39C0G330J50 | 33PF CAPACITOR 1608 |
| C221 | GRM36C0G030C50 | 3PF CAPACITOR 1005 |
| C222 | GRM36C0G030C50 | 3PF CAPACITOR 1005 |
| C223 | GRM36X7R102J50 | 1NF CAPACITOR 1005 |
| C224 | GRM39C0G470J50 | 47PF CAPACITOR 1608 |
| C225 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C226 | GRM39C0G820J50 | 82PF CAPACITOR 1608 |

| Ref. | Part Number | Description |
|---|---|---|
| C227 | GRM36C0G070C50 | 7PF CAPACITOR 1005 |
| C228 | GRM36X7R102J50 | 1NF CAPACITOR 1005 |
| C23 | GRM39Y5V104Z25 | 100NF CAPACITOR 1608 |
| C230 | GRM36X7R102J50 | 1NF CAPACITOR 1005 |
| C232 | GRM36X7R102J50 | 1NF CAPACITOR 1005 |
| C233 | GRM36X7R102J50 | 1NF CAPACITOR 1005 |
| C234 | GRM36C0G040C50 | 4PF CAPACITOR 1005 |
| C235 | GRM36X7R103K16 | 10NF CAPACITOR 1005 |
| C236 | ECST0JY475ZR | 4.7U/6.3V CAPACITOR |
| C237 | GRM36X7R102J50 | 1NF CAPACITOR 1005 |
| C238 | GRM36X7R102J50 | 1NF CAPACITOR 1005 |
| C239 | GRM36X7R102J50 | 1NF CAPACITOR 1005 |
| C24 | GRM36Y5V473Z16 | 47NF CAPACITOR 1005 |
| C240 | GRM36C0G430J50 | 43PF CAPACITOR 1005 |
| C241 | GRM36C0G050C50 | 5PF CAPACITOR 1005 |
| C242 | GRM36C0G430J50 | 43PF CAPACITOR 1005 |
| C243 | GRM36X7R102J50 | 1NF CAPACITOR 1005 |
| C245 | GRM36X7R103K16 | 10NF CAPACITOR 1005 |
| C246 | ECST0JY475ZR | 4.7U/6.3V CAPACITOR |
| C25 | GRM39C0G100D50 | 10PF CAPACITOR 1608 |
| C254 | GRM36X7R102J50 | 1NF CAPACITOR 1005 |
| C255 | GRM36X7R102J50 | 1NF CAPACITOR 1005 |
| C256 | GRM36X7R103K16 | 10NF CAPACITOR 1005 |
| C257 | ECST0JY475ZR | 4.7U/6.3V CAPACITOR |
| C258 | GRM36X7R102J50 | 1NF CAPACITOR 1005 |
| C259 | GRM36X7R102J50 | 1NF CAPACITOR 1005 |
| C26 | GRM39Y5V104Z25 | 100NF CAPACITOR 1608 |
| C260 | GRM36X7R102J50 | 1NF CAPACITOR 1005 |
| C261 | GRM36X7R102J50 | 1NF CAPACITOR 1005 |
| C262 | GRM36X7R103K16 | 10NF CAPACITOR 1005 |
| C263 | GRM36X7R102J50 | 1NF CAPACITOR 1005 |
| C266 | GRM39X7R332K50 | 3.3NF CAPACITOR 1608 |
| C268 | GRM36X7R102J50 | 1NF CAPACITOR 1005 |
| C27 | GRM36C0G101J50 | 100PF CAPACITOR 1005 |
| C270 | GRM36X7R102J50 | 1NF CAPACITOR 1005 |
| C271 | GRM36C0G050C50 | 5PF CAPACITOR 1005 |
| C272 | GRM36X7R102J50 | 1NF CAPACITOR 1005 |
| C273 | ECST0JY475ZR | 4.7U/6.3V CAPACITOR |
| C274 | GRM36X7R102J50 | 1NF CAPACITOR 1005 |
| C275 | GRM36X7R102J50 | 1NF CAPACITOR 1005 |
| C277 | GRM36X7R102J50 | 1NF CAPACITOR 1005 |
| C279 | GRM39C0G100D50 | 10PF CAPACITOR 1608 |
| C28 | GRM36Y5V473Z16 | 47NF CAPACITOR 1005 |
| C280 | GRM39C0G221J50 | 220PF CAPACITOR 1608 |
| C281 | GRM36C0G330J50 | 33PF CAPACITOR 1005 |
| C282 | GRM36X7R103K16 | 10NF CAPACITOR 1005 |
| C283 | GRM36C0G1R5C50 | 1.5PF CAPACITOR 1005 |
| C284 | GRM36C0G020C50 | 2PF CAPACITOR 1005 |
| C285 | GRM36C0G330J50 | 33PF CAPACITOR 1005 |
| C286 | GRM36C0G330J50 | 33PF CAPACITOR 1005 |
| C287 | GRM36X7R103K16 | 10NF CAPACITOR 1005 |
| C289 | GRM39X7R392K50 | 3.9NF CAPACITOR 1608 |
| C29 | GRM39X7R223K25 | 22NF CAPACITOR 1608 |
| C290 | GRM39C0G271J50 | 270PF CAPACITOR 1608 |
| C292 | GRM39X7R223K25 | 22NF CAPACITOR 1608 |
| C293 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C295 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C296 | GRM36X7R681J50 | 680PF CAPACITOR 1005 |
| C297 | GRM36X7R122J50 | 1.2NF CAPACITOR 1005 |
| C298 | GRM39X7R821J50 | 820PF CAPACITOR 1608 |
| C3 | GRM36Y5V473Z16 | 47NF CAPACITOR 1005 |
| C30 | GRM36Y5V473Z16 | 47NF CAPACITOR 1005 |
| C302 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C303 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C304 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C307 | GRM36X7R103K16 | 10NF CAPACITOR 1005 |
| C308 | GRM36X7R103K16 | 10NF CAPACITOR 1005 |
| C309 | GRM36X7R103K16 | 10NF CAPACITOR 1005 |
| C31 | GRM36Y5V473Z16 | 47NF CAPACITOR 1005 |
| C310 | ECST1CC106ZR | 10U/16V CAPACITOR |
| C312 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C313 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |

| Ref. | Part Number | Description |
|---|---|---|
| C314 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C315 | GRM36C0G330J50 | 33PF CAPACITOR 1005 |
| C316 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C317 | GRM36C0G330J50 | 33PF CAPACITOR 1005 |
| C318 | GRM36C0G330J50 | 33PF CAPACITOR 1005 |
| C319 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C32 | GRM36Y5V473Z16 | 47NF CAPACITOR 1005 |
| C321 | GRM39C0G330J50 | 33PF CAPACITOR 1608 |
| C322 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C323 | GRM39C0G331J50 | 330PF CAPACITOR 1608 |
| C325 | ECST0JB106ZR | 10U/6.3V CAPACITOR UKF |
| C327 | GRM36X7R102J50 | 1NF CAPACITOR 1005 |
| C328 | GRM36X7R103K16 | 10NF CAPACITOR 1005 |
| C329 | GRM36X7R102J50 | 1NF CAPACITOR 1005 |
| C330 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C332 | GRM36X7R103K16 | 10NF CAPACITOR 1005 |
| C37 | GRM36X7R102J50 | 1NF CAPACITOR 1005 |
| C38 | GRM36X7R102J50 | 1NF CAPACITOR 1005 |
| C39 | GRM36X7R103K16 | 10NF CAPACITOR 1005 |
| C4 | GRM36Y5V473Z16 | 47NF CAPACITOR 1005 |
| C40 | GRM36X7R103K16 | 10NF CAPACITOR 1005 |
| C41 | GRM36X7R103K16 | 10NF CAPACITOR 1005 |
| C42 | GRM36X7R103K16 | 10NF CAPACITOR 1005 |
| C43 | GRM36X7R103K16 | 10NF CAPACITOR 1005 |
| C44 | ECST1AY475ZR | 4.7U/10V CAPACITOR |
| C45 | ECST1AY475ZR | 4.7U/10V CAPACITOR |
| C47 | GRM36Y5V333Z16 | 33NF CAPACITOR 1005 |
| C49 | GRM36C0G330J50 | 33PF CAPACITOR 1005 |
| C5 | GRM36Y5V473Z16 | 47NF CAPACITOR 1005 |
| C50 | GRM36C0G330J50 | 33PF CAPACITOR 1005 |
| C51 | GRM36C0G330J50 | 33PF CAPACITOR 1005 |
| C52 | GRM36C0G330J50 | 33PF CAPACITOR 1005 |
| C53 | GRM36C0G330J50 | 33PF CAPACITOR 1005 |
| C54 | GRM36C0G330J50 | 33PF CAPACITOR 1005 |
| C55 | GRM36C0G470J50 | 47PF CAPACITOR 1005 |
| C56 | GRM36C0G101J50 | 100PF CAPACITOR 1005 |
| C57 | GRM36X7R103K16 | 10NF CAPACITOR 1005 |
| C59 | ECST0GY106ZR | 10U/4V CAPACITOR |
| C6 | GRM36Y5V473Z16 | 47NF CAPACITOR 1005 |
| C60 | ECST0GY106ZR | 10U/4V CAPACITOR |
| C61 | GRM39Y5V104Z25 | 100NF CAPACITOR 1608 |
| C62 | GRM36Y5V473Z16 | 47NF CAPACITOR 1005 |
| C63 | GRM36Y5V473Z16 | 47NF CAPACITOR 1005 |
| C65 | GRM36C0G101J50 | 100PF CAPACITOR 1005 |
| C66 | GRM36C0G101J50 | 100PF CAPACITOR 1005 |
| C7 | GRM36Y5V473Z16 | 47NF CAPACITOR 1005 |
| C70 | GRM39Y5V104Z25 | 100NF CAPACITOR 1608 |
| C700 | GRM39C0G220J50 | 22PF CAPACITOR 1608 |
| C701 | GRM39C0G050C50 | 5PF CAPACITOR 1608 |
| C702 | GRM39C0G300J50 | 30PF CAPACITOR 1608 |
| C703 | GRM39C0G040C50 | 4PF CAPACITOR 1608 |
| C71 | GRM39C0G360J50 | 36PF CAPACITOR 1608 |
| C75 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C8 | GRM36Y5V473Z16 | 47NF CAPACITOR 1005 |
| C80 | ECST1VX105ZR | 1U/35V CAPACITOR |
| C82 | ECST1AY475ZR | 4.7U/10V CAPACITOR |
| C83 | ECST1CY335ZR | 3.3U/16V CAPACITOR |
| C87 | GRM36C0G101J50 | 100PF CAPACITOR 1005 |
| C88 | GRM36C0G101J50 | 100PF CAPACITOR 1005 |
| C89 | GRM36C0G101J50 | 100PF CAPACITOR 1005 |
| C9 | GRM36Y5V473Z16 | 47NF CAPACITOR 1005 |
| C90 | GRM36C0G101J50 | 100PF CAPACITOR 1005 |
| C91 | GRM36C0G101J50 | 100PF CAPACITOR 1005 |
| C92 | GRM36C0G101J50 | 100PF CAPACITOR 1005 |
| CANTSW | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| CBUZ-* | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| CBUZ+* | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| CD205* | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| CFL207 | GRM39C0G050C50 | 5PF CAPACITOR 1608 |
| CL219 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| CL238* | GRM39C0G300J50 | 30PF CAPACITOR 1608 |
| CMIC*4 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |

| Ref. | Part Number | Description |
|---|---|---|
| CMIC** | GRM36C0G101J50 | 100PF CAPACITOR 1005 |
| CMIC+- | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| CMIC+* | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| CPR127 | GRM36X7R102J50 | 1NF CAPACITOR 1005 |
| CPR130 | GRM36X7R102J50 | 1NF CAPACITOR 1005 |
| CPR142 | GRM36X7R332J50 | 3.3NF CAPACITOR 1005 |
| CPR264 | GRM36X7R331K50 | 330PF CAPACITOR 1005 |
| CPR44* | GRM36X7R103K16 | 10NF CAPACITOR 1005 |
| CPR46* | GRM39C0G331J50 | 330PF CAPACITOR 1608 |
| CPR47* | GRM39C0G331J50 | 330PF CAPACITOR 1608 |
| CQ215* | GRM39C0G040C50 | 4PF CAPACITOR 1608 |
| CQ22** | GRM36X7R103K16 | 10NF CAPACITOR 1005 |
| CQ48** | GRM36C0G101J50 | 100PF CAPACITOR 1005 |
| CR15** | GRM39C0G221J50 | 220PF CAPACITOR 1608 |
| CR271* | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| CU16*1 | GRM36C0G221J50 | 220PF CAPACITOR 1005 |
| CU16*2 | GRM36C0G221J50 | 220PF CAPACITOR 1005 |
| CU16** | GRM36C0G330J50 | 33PF CAPACITOR 1005 |
| CU205* | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| CU230* | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| CU44*3 | GRM39C0G330J50 | 33PF CAPACITOR 1608 |
| CU44*4 | GRM39C0G330J50 | 33PF CAPACITOR 1608 |
| D1 | BAS16A6P | DIODE |
| D2 | BAV99A7P | DIODE |
| D201 | SMP131103 | DIODE |
| D202 | SMP131103 | DIODE |
| D203 | ZC2800E | DIODE |
| D204 | ZC2800E | DIODE |
| D205 | BAV99A7P | DIODE |
| D206 | BAS16A6P | DIODE |
| D21 | MA718TX | DIODE |
| D23 | MA738TX | DIODE |
| D30 | MA8056LTX | ZENER DIODE |
| D31 | MA8056LTX | ZENER DIODE |
| D32 | MA8056LTX | ZENER DIODE |
| D9 | MA718TX | DIODE |
| DA1 | DA10475B | LCD BACKLIGHT |
| DA2 | DA10474B | LCD & TAB |
| DS1 | CL155DGDT | 2 COLOUR LED |
| DS2 | CL155DGDT | 2 COLOUR LED |
| DS3 | CL155DGDT | 2 COLOUR LED |
| DS4 | CL155DGDT | 2 COLOUR LED |
| DS5 | CL155DGDT | 2 COLOUR LED |
| DS6 | CL155DGDT | 2 COLOUR LED |
| DS7 | CL155DGDT | 2 COLOUR LED |
| DS8 | CL155DGDT | 2 COLOUR LED |
| E1 | EG12601B | DTC (BLANK) |
| E1001 | SY10064A | REED SW (OKI-ORD211-149 1824) |
| E2 | EG12357A | FLEXIBLE PCB |
| E2000 | JS10013AA | SIMLOCK BASE |
| E2001 | JS10013AB | SIM LOCK SLIDER TRAY |
| F1 | F1206A2R00FWTR | 2A FUSE |
| F201 | F1206A2R00FWTR | 2A FUSE |
| FL204 | FARF5CC947M50 | 935-960MHZ BPF |
| FL205 | LFC3001B0869B0 | 869 MHZ BPF |
| FL206 | DW9241 | 79 MHZ CHANNEL SAW BPF |
| FL207 | DW9241 | 79 MHZ CHANNEL SAW BPF |
| FL208 | TH356BTJ6329 | 812 KHZ BPF |
| FL209 | FARF5CC902M50 | 890-915 MHZ BPF |
| FL210 | FARF5CC902M50 | 890-915 MHZ BPF |
| FL211 | EZFAD902D947A | ANTENNA SW (FILTER) (FL10129A) |
| J1 | JY10055A | ZEBRA STRIP (KBD CN) |
| J2 | 086212010010800 | SIM CN |
| J201 | JY10024A | 4 PIN CN FEMALE |
| J202 | JY10024A | 4 PIN CN FEMALE |
| J203 | JY10024A | 4 PIN CN FEMALE |
| J204 | JY10024A | 4 PIN CN FEMALE |
| J205 | 31756347 | SMALL SUB PCB CN (MALE) |
| J4 | JA10022A | I/O CN |
| J5 | MM63292700TB2 | RF CONNECTOR |
| L2001 | LL2012F10NK | 10NH INDUCTOR |
| L201 | 1008LS103XKBC | 10UH INDUCTOR +/-10% |

| Ref. | Part Number | Description |
|---|---|---|
| L202 | 1008CS391XJBC | 390NH INDUCTOR +/-5% |
| L210 | 0805CS101XKBC | 100NH INDUCTOR +/-10% |
| L211 | 0805CS101XKBC | 100NH INDUCTOR +/-10% |
| L212 | LL2012F6N8K | 6.8NH INDUCTOR |
| L213 | 1008CS181XKBC | 180NH INDUCTOR +/-10% |
| L214 | 1008CS181XKBC | 180NH INDUCTOR +/-10% |
| L218 | LL2012F82NK | 82NH INDUCTOR |
| L220 | LL2012F15NK | 15NH INDUCTOR |
| L221 | LL2012F8N2K | 8.2NH INDUCTOR |
| L222 | LL2012F10NK | 10NH INDUCTOR |
| L224 | LL2012F10NK | 10NH INDUCTOR |
| L225 | ELJSA221KF | 220UH INDUCTOR |
| L229 | 0805CS221XKBC | 220NH INDUCTOR +/-10% |
| L230 | 0805CS221XKBC | 220NH INDUCTOR +/-10% |
| L231 | 0805CS101XKBC | 100NH INDUCTOR +/-10% |
| L235 | LL2012F10NK | 10NH INDUCTOR |
| L236 | 1008LS103XKBC | 10UH INDUCTOR +/-10% |
| L237 | LL2012F10NK | 10NH INDUCTOR |
| L238 | 1008CS331XKBC | 330NH INDUCTOR +/-10% |
| L239 | 1008CS391XJBC | 390NH INDUCTOR +/-5% |
| L700 | 1008CS331XKBC | 330NH INDUCTOR +/-10% |
| LANT** | LZ70001A | HAND WOUND INDUCTOR |
| LC2019 | LL2012F82NK | 82NH INDUCTOR |
| LC278* | LL2012F15NK | 15NH INDUCTOR |
| LFL207 | 1008CS181XKBC | 180NH INDUCTOR +/-10% |
| LMIC*1 | 0805CS101XKBC | 100NH INDUCTOR +/-10% |
| LMIC*2 | 0805CS101XKBC | 100NH INDUCTOR +/-10% |
| LR260* | LL2012F8N2K | 8.2NH INDUCTOR |
| LS1 | HH10015A | EARPIECE (SPEAKER) |
| LS2 | CB09AW | BUZZER |
| LU16*1 | 0805CS101XKBC | 100NH INDUCTOR +/-10% |
| LU16*2 | 0805CS101XKBC | 100NH INDUCTOR +/-10% |
| LU211* | 1008LS103XKBC | 10UH INDUCTOR +/-10% |
| LU230* | LL2012F6N8K | 6.8NH INDUCTOR |
| MK1 | WM62AT102 | MICROPHONE |
| P201 | PY10015A | 4 PIN CN MALE |
| P202 | PY10015A | 4 PIN CN MALE |
| P203 | PY10015A | 4 PIN CN MALE |
| P204 | PY10015A | 4 PIN CN MALE |
| P205 | 31756287 | SMALL SUB PCB CN (FEMALE) |
| Q1 | UMG3T148 | TRANSISTOR |
| Q201 | DTC124EK | TRANSISTOR |
| Q202 | UMA1T148 | TRANSISTOR |
| Q205 | 2PB709AS | TRANSISTOR |
| Q206 | 2PB709AS | TRANSISTOR |
| Q207 | 2SC4095TX | TRANSISTOR |
| Q208 | IMH5T148 | TRANSISTOR |
| Q209 | 2PB709AS | TRANSISTOR |
| Q211 | 2PB709AS | TRANSISTOR |
| Q212 | 2SC4081TX | TRANSISTOR |
| Q213 | 2PB709AS | TRANSISTOR |
| Q215 | BF513 | TRANSISTOR |
| Q216 | 2SC4081TX | TRANSISTOR |
| Q217 | 2SC4081TX | TRANSISTOR |
| Q218 | 2SC4081TX | TRANSISTOR |
| Q219 | 2SC4081TX | TRANSISTOR |
| Q22 | UMG2T148 | TRANSISTOR |
| Q25 | UMC2T148 | TRANSISTOR |
| Q26 | FMG8T148 | TRANSISTOR |
| Q27 | FMG8T148 | TRANSISTOR |
| Q28 | UMA5T148 | TRANSISTOR |
| Q29 | FMMT491TA | TRANSISTOR |
| Q33 | UMG3T148 | TRANSISTOR |
| Q34 | UMC2T148 | TRANSISTOR |
| Q35 | 2PB709AS | TRANSISTOR |
| Q36 | UMG3T148 | TRANSISTOR |
| Q37 | UMH2T148 | TRANSISTOR |
| Q38 | UMC1T148 | TRANSISTOR |
| Q39 | UMC1T148 | TRANSISTOR |
| Q40 | UMG5T148 | TRANSISTOR |
| Q41 | UMT1T148 | TRANSISTOR |
| Q42 | 2PB709AS | TRANSISTOR |

| Ref. | Part Number | Description |
|---|---|---|
| Q43 | 2PB709AS | TRANSISTOR |
| Q44 | 2SC4081TX | TRANSISTOR |
| Q45 | 2SJ317NYTR | TRANSISTOR |
| Q46 | 2SJ317NYTR | TRANSISTOR |
| Q47 | 2PB709AS | TRANSISTOR |
| Q48 | 2SC4081TX | TRANSISTOR |
| Q49 | UMC1T148 | TRANSISTOR |
| Q50 | FMC3T99 | TRANSISTOR (D SERIES) |
| Q700 | 2PB709AS | TRANSISTOR |
| Q800** | 2PB709AS | TRANSISTOR |
| R1 | ERJ2GEYJ332V | 3.3K RESISTOR 1005 |
| R10 | ERJ3GEYJ223V | 22K RESISTOR 1608 |
| R100 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R11 | ERJ3GEYJ561V | 560R RESISTOR 1608 |
| R112 | ERJ2GEYJ101V | 100R RESISTOR 1005 |
| R113 | ERJ2GEYJ101V | 100R RESISTOR 1005 |
| R114 | ERJ3GEYJ564V | 560K RESISTOR 1608 |
| R117 | ERJ2GEYJ473V | 47K RESISTOR 1005 |
| R118 | ERJ2GEYJ473V | 47K RESISTOR 1005 |
| R119 | ERJ3GEYJ332V | 3.3K RESISTOR 1608 |
| R121 | ERJ2GEYJ564V | 560K RESISTOR 1005 |
| R122 | ERJ2GEYJ101V | 100R RESISTOR 1005 |
| R123 | ERJ2GEYJ102V | 1K RESISTOR 1005 |
| R124 | ERJ2GEYJ330V | 33R RESISTOR 1005 |
| R125 | ERJ2GEYJ330V | 33R RESISTOR 1005 |
| R127 | ERJ2GEF333X | 33K RESISTOR 1005 +/-1% |
| R128 | ERJ2GEF333X | 33K RESISTOR 1005 +/-1% |
| R129 | ERJ2GEF333X | 33K RESISTOR 1005 +/-1% |
| R13 | ERJ2GEF104X | 100K RESISTOR 1005 +/-1% |
| R130 | ERJ2GEF333X | 33K RESISTOR 1005 +/-1% |
| R132 | ERJ3GEYJ332V | 3.3K RESISTOR 1608 |
| R133 | ERJ3GEYJ332V | 3.3K RESISTOR 1608 |
| R134 | ERJ3GEYJ332V | 3.3K RESISTOR 1608 |
| R135 | ERJ2GEF104X | 100K RESISTOR 1005 +/-1% |
| R136 | ERJ2GEF103X | 10K RESISTOR 1005 +/-1% |
| R137 | ERJ3RHD333S | 33K RESISTOR 1608 +/-0.5% |
| R138 | ERJ3RHD823S | 82K RESISTOR 1608 +/-0.5% |
| R139 | ERJ3RHD333S | 33K RESISTOR 1608 +/-0.5% |
| R140 | ERJ2GEF103X | 10K RESISTOR 1005 +/-1% |
| R141 | ERJ2GEF103X | 10K RESISTOR 1005 +/-1% |
| R142 | ERJ2GEYJ102V | 1K RESISTOR 1005 |
| R143 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R144 | ERJ3RHD222S | 2.2K RESISTOR 1608 +/-0.5% |
| R145 | ERJ3RHD273S | 27K RESISTOR 1608 +/-0.5% |
| R146 | ERJ3RHD103S | 10K RESISTOR 1608 +/-0.5% |
| R147 | ERJ3RHD682S | 6.8K RESISTOR 1608 +/-0.5% |
| R148 | ERJ3GEYJ334V | 330K RESISTOR 1608 |
| R15 | ERJ3GEYJ224V | 220K RESISTOR 1608 |
| R150 | ERJ3GEYJ332V | 3.3K RESISTOR 1608 |
| R151 | ERJ3GEYJ332V | 3.3K RESISTOR 1608 |
| R152 | ERJ2GEF104X | 100K RESISTOR 1005 +/-1% |
| R153 | ERJ3RHD333S | 33K RESISTOR 1608 +/-0.5% |
| R154 | ERJ2GEF103X | 10K RESISTOR 1005 +/-1% |
| R16 | ERJ3GEYJ104V | 100K RESISTOR 1608 |
| R17 | ERJ3GEYF823V | 82K RESISTOR 1608 +/-1% |
| R18 | ERJ3GEYJ104V | 100K RESISTOR 1608 |
| R19 | ERJ3GEYJ564V | 560K RESISTOR 1608 |
| R2 | ERJ2GEYJ332V | 3.3K RESISTOR 1005 |
| R2000 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R2001 | ERJ3GEYJ100V | 10R RESISTOR 1608 |
| R2002 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R2003 | ERJ3GEYJ220V | 22R RESISTOR 1608 |
| R2004 | ERJ3RHD333S | 33K RESISTOR 1608 +/-0.5% |
| R2005 | ERJ3GEYJ561V | 560R RESISTOR 1608 |
| R2006 | ERJ3GEYJ331V | 330R RESISTOR 1608 |
| R2008 | ERJ3GEYJ102V | 1K RESISTOR 1608 |
| R2009 | ERJ3RHD333S | 33K RESISTOR 1608 +/-0.5% |
| R201 | ERJ3GEYJ102V | 1K RESISTOR 1608 |
| R2010 | ERJ3GEYJ332V | 3.3K RESISTOR 1608 |
| R2011 | ERJ3GEYJ332V | 3.3K RESISTOR 1608 |
| R2012 | ERJ3GEYJ332V | 3.3K RESISTOR 1608 |
| R2013 | ERJ3GEYJ332V | 3.3K RESISTOR 1608 |

| Ref. | Part Number | Description |
|---|---|---|
| R2014 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| R2015 | ERJ2GEF332X | 3.3K RESISTOR 1005 +/-1% |
| R2017 | ERJ3GEYJ102V | 1K RESISTOR 1608 |
| R2018 | ERJ3GEYJ181V | 180R RESISTOR 1608 |
| R2018 | ERJ3GEYJ331V | 330R RESISTOR 1608 |
| R2019 | ERJ3GEYJ102V | 1K RESISTOR 1608 |
| R2020 | ERJ3GEYJ102V | 1K RESISTOR 1608 |
| R2021 | ERJ3GEYJ102V | 1K RESISTOR 1608 |
| R2022 | ERJ3GEYJ102V | 1K RESISTOR 1608 |
| R2023 | ERJ3GEYJ104V | 100K RESISTOR 1608 |
| R2024 | ERJ3GEYJ102V | 1K RESISTOR 1608 |
| R2025 | ERJ3GEYJ471V | 470R RESISTOR 1608 |
| R203 | ERJ3GEYJ332V | 3.3K RESISTOR 1608 |
| R205 | ERJ3GEYJ100V | 10R RESISTOR 1608 |
| R206 | ERJ3GEYJ182V | 1.8K RESISTOR 1608 |
| R207 | ERJ2GEYJ182V | 1.8K RESISTOR 1005 |
| R208 | ERJ2GEYJ0R0V | 0R RESISTOR 1005 |
| R209 | ERJ2GEYJ332V | 3.3K RESISTOR 1005 |
| R213 | ERJ3GEYJ100V | 10R RESISTOR 1608 |
| R215 | ERJ2GEYJ561V | 560R RESISTOR 1005 |
| R2151 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R2152 | ERJ3GEYJ0R0V | 0R RESISTOR 1608 |
| R216 | ERJ2GEYJ561V | 560R RESISTOR 1005 |
| R22 | ERJ3GEYJ334V | 330K RESISTOR 1608 |
| R221 | ERJ2GEYJ100V | 10R RESISTOR 1005 |
| R222 | ERJ2GEYJ101V | 100R RESISTOR 1005 |
| R223 | ERJ2GEYJ101V | 100R RESISTOR 1005 |
| R224 | ERJ2GEYJ101V | 100R RESISTOR 1005 |
| R225 | ERJ2GEYJ101V | 100R RESISTOR 1005 |
| R226 | ERJ2GEYJ101V | 100R RESISTOR 1005 |
| R227 | ERJ2GEYJ101V | 100R RESISTOR 1005 |
| R228 | ERJ2GEF103X | 10K RESISTOR 1005 +/-1% |
| R229 | ERJ3GEYJ100V | 10R RESISTOR 1608 |
| R23 | ERJ3GEYJ334V | 330K RESISTOR 1608 |
| R230 | ERJ2GEYJ332V | 3.3K RESISTOR 1005 |
| R235 | ERJ3GEYJ104V | 100K RESISTOR 1608 |
| R236 | ERJ2GEYJ332V | 3.3K RESISTOR 1005 |
| R237 | ERJ3GEYJ104V | 100K RESISTOR 1608 |
| R238 | ERJ2GEYJ332V | 3.3K RESISTOR 1005 |
| R239 | ERJ2GEYJ101V | 100R RESISTOR 1005 |
| R240 | ERJ2GEYJ101V | 100R RESISTOR 1005 |
| R241 | ERJ2GEYJ101V | 100R RESISTOR 1005 |
| R242 | ERJ2GEYJ101V | 100R RESISTOR 1005 |
| R243 | ERJ2GEYJ101V | 100R RESISTOR 1005 |
| R244 | ERJ2GEYJ101V | 100R RESISTOR 1005 |
| R245 | ERJ3GEYJ100V | 10R RESISTOR 1608 |
| R246 | ERJ2GEF562X | 5.6K RESISTOR 1005 +/-1% |
| R247 | ERJ3GEYJ223V | 22K RESISTOR 1608 |
| R248 | ERJ2GEYJ333V | 33K RESISTOR 1005 |
| R249 | ERJ2GEF103X | 10K RESISTOR 1005 +/-1% |
| R25 | ERJ2GEYJ472V | 4.7K RESISTOR 1005 |
| R250 | ERJ2GEYJ220V | 22R RESISTOR 1005 |
| R251 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R252 | ERJ3GEYJ100V | 10R RESISTOR 1608 |
| R253 | ERJ3RHD182S | 1.8K RESISTOR 1608 +/-0.5% |
| R254 | ERJ3RHD681S | 680R RESISTOR 1608 +/-0.5% |
| R255 | ERJ2GEYJ471V | 470R RESISTOR 1608 |
| R256 | ERJ3GEYJ330V | 33R RESISTOR 1608 |
| R257 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R259 | ERJ3GEYJ221V | 220R RESISTOR 1608 |
| R26 | ERJ2GEYJ222V | 2.2K RESISTOR 1005 |
| R261 | ERJ3GEYJ330V | 33R RESISTOR 1608 |
| R262 | ERJ3GEYF332V | 3.3K RESISTOR 1608 +/-1% |
| R263 | ERJ3GEYF332V | 3.3K RESISTOR 1608 +/-1% |
| R264 | ERJ2GEF332X | 3.3K RESISTOR 1005 +/-1% |
| R265 | ERJ3GEYF332V | 3.3K RESISTOR 1608 +/-1% |
| R27 | ERJ3GEYJ181V | 180R RESISTOR 1608 |
| R270 | ERJ3RHD333S | 33K RESISTOR 1608 +/-0.5% |
| R271 | ERJ3GEYJ102V | 1K RESISTOR 1608 |
| R272 | ERJ3GEYJ102V | 1K RESISTOR 1608 |
| R273 | ERJ3GEYJ330V | 33R RESISTOR 1608 |
| R274 | ERJ3GEYJ102V | 1K RESISTOR 1608 |

| Ref. | Part Number | Description |
|---|---|---|
| R275 | ERJ3GEYJ330V | 33R RESISTOR 1608 |
| R276 | ERJ3GEYJ332V | 3.3K RESISTOR 1608 |
| R277 | ERJ3GEYJ152V | 1.5K RESISTOR 1608 |
| R278 | ERJ3GEYJ100V | 10R RESISTOR 1608 |
| R279 | ERJ3GEYJ102V | 1K RESISTOR 1608 |
| R28 | ERJ3GEYJ822V | 8.2K RESISTOR 1608 |
| R280 | ERJ3GEYJ104V | 100K RESISTOR 1608 |
| R287 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R288 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R289 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R29 | ERJ2GEF104X | 100K RESISTOR 1005 +/-1% |
| R290 | ERJ3GEYJ100V | 10R RESISTOR 1608 |
| R292 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R293 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R294 | ERJ3GEYJ331V | 330R RESISTOR 1608 |
| R295 | ERJ3GEYJ102V | 1K RESISTOR 1608 |
| R297 | ERJ2GEYJ561V | 560R RESISTOR 1005 |
| R299 | ERJ3GEYJ104V | 100K RESISTOR 1608 |
| R3 | ERJ3GEYJ562V | 5.6K RESISTOR 1608 |
| R30 | ERJ2GEF103X | 10K RESISTOR 1005 +/-1% |
| R300 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R3000 | ERJ3GEYJ222V | 2.2K RESISTOR 1608 |
| R31 | ERJ2GEF103X | 10K RESISTOR 1005 +/-1% |
| R32 | ERJ2GEF103X | 10K RESISTOR 1005 +/-1% |
| R33 | ERJ2GEF103X | 10K RESISTOR 1005 +/-1% |
| R34 | ERJ2GEF103X | 10K RESISTOR 1005 +/-1% |
| R35 | ERJ2GEYJ473V | 47K RESISTOR 1005 |
| R36 | ERJ3RHD333S | 33K RESISTOR 1608 +/-0.5% |
| R37 | ERJ2GEYJ473V | 47K RESISTOR 1005 |
| R38 | ERJ3RHD333S | 33K RESISTOR 1608 +/-0.5% |
| R39 | ERJ3RHD333S | 33K RESISTOR 1608 +/-0.5% |
| R4 | ERJ3GEYJ562V | 5.6K RESISTOR 1608 |
| R40 | ERJ2GEYJ473V | 47K RESISTOR 1005 |
| R4000 | ERJ2GEYJ331V | 330R RESISTOR 1005 |
| R43 | ERJ2GEF103X | 10K RESISTOR 1005 +/-1% |
| R44 | ERJ2GEF103X | 10K RESISTOR 1005 +/-1% |
| R45 | ERJ3RHD363S | 36K RESISTOR 1608 +/-0.5% |
| R46 | ERJ3RHD183S | 18K RESISTOR 1608 +/-0.5% |
| R47 | ERJ3RHD183S | 18K RESISTOR 1608 +/-0.5% |
| R5 | ERJ3GEYJ563V | 56K RESISTOR 1608 |
| R50 | ERJ2GEF104X | 100K RESISTOR 1005 +/-1% |
| R53 | ERJ2GEF104X | 100K RESISTOR 1005 +/-1% |
| R54 | ERJ2GEF104X | 100K RESISTOR 1005 +/-1% |
| R57 | ERJ2GEYJ101V | 100R RESISTOR 1005 |
| R58 | ERJ2GEYJ473V | 47K RESISTOR 1005 |
| R6 | ERJ3RHD333S | 33K RESISTOR 1608 +/-0.5% |
| R60 | ERJ3GEYJ0R0V | 0R RESISTOR 1608 |
| R62 | ERJ3GEYJ0R0V | 0R RESISTOR 1608 |
| R68 | ERJ3RHD363S | 36K RESISTOR 1608 +/-0.5% |
| R69 | ERJ3RHD203S | 20K RESISTOR 1608 +/-0.5% |
| R7 | ERJ3GEYJ562V | 5.6K RESISTOR 1608 |
| R70 | ERJ3RHD123S | 12K RESISTOR 1608 +/-0.5% |
| R700 | ERJ2GEYJ332V | 3.3K RESISTOR 1005 |
| R701 | ERJ2GEYJ221V | 220R RESISTOR 1005 |
| R702 | ERJ2GEYJ332V | 3.3K RESISTOR 1005 |
| R704 | ERJ3RHD333S | 33K RESISTOR 1608 +/-0.5% |
| R705 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R706 | ERJ3GEYJ332V | 3.3K RESISTOR 1608 |
| R71 | ERJ3GEYJ564V | 560K RESISTOR 1608 |
| R72 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| R73 | ERJ3GEYJ331V | 330R RESISTOR 1608 |
| R74 | ERJ3GEYJ680V | 68R RESISTOR 1608 |
| R75 | ERJ3GEYJ150V | 15R RESISTOR 1608 |
| R76 | ERJ3GEYJ0R0V | 0R RESISTOR 1608 |
| R77 | ERJ3GEYJ681V | 680R RESISTOR 1608 |
| R78 | ERJ2GEYJ473V | 47K RESISTOR 1005 |
| R79 | ERJ2GEF104X | 100K RESISTOR 1005 +/-1% |
| R8 | ERJ2GEF103X | 10K RESISTOR 1005 +/-1% |
| R80 | ERJ2GEF104X | 100K RESISTOR 1005 +/-1% |
| R81 | ERJ2GEF104X | 100K RESISTOR 1005 +/-1% |
| R82 | ERJ2GEF104X | 100K RESISTOR 1005 +/-1% |
| R83 | ERJ3GEYJ564V | 560K RESISTOR 1608 |

| Ref. | Part Number | Description |
|---|---|---|
| R85 | ERJ2GEYJ473V | 47K RESISTOR 1005 |
| R86 | ERJ3GEYJ332V | 3.3K RESISTOR 1608 |
| R87 | ERJ2GEF104X | 100K RESISTOR 1005 +/-1% |
| R88 | ERJ2GEF103X | 10K RESISTOR 1005 +/-1% |
| R9 | ERJ3GEYJ472V | 4.7K RESISTOR 1608 |
| R91 | ERJ3GEYJ330V | 33R RESISTOR 1608 |
| R92 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R93 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R94 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R96 | ERJ3GEYJ0R0V | 0R RESISTOR 1608 |
| R99 | ERJ2GEYJ101V | 100R RESISTOR 1005 |
| RC244 | ERJ2GEYJ331V | 330R RESISTOR 1005 |
| RD205* | ERJ3RHD103V | 10K RESISTOR 1608 +/-0.5% |
| RFL211 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| RL221* | ERJ3GEYJ332V | 3.3K RESISTOR 1608 |
| RQ800* | ERJ3GEYJ332V | 3.3K RESISTOR 1608 |
| RT1 | 15730353001 | THERMISTOR |
| RU217* | ERJ2GEYJ220V | 22R RESISTOR 1005 |
| RU44*1 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| RU44*2 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| RU44*3 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| RU44*4 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| S201 | JC10017A | EXTERNAL RF CONNECTOR |
| U1 | MC68331CFV | MICROCONTROLLER |
| U10 | VP06476 | TIMING CONTROL (TIM) |
| U11 | VP06238 | EQUALISER |
| U12 | MP8775AQ | A-D CONVERTER |
| U13 | HM62256ALT8LL | SRAM |
| U14 | TC7S04FU | INVERTER |
| U15 | MN1911013CQY | SPEECH PROCESSOR |
| U16 | UY10082A | AUDIO IC |
| U17 | MN76047LCV | MIXED ANALOG & DIGITAL IC |
| U2 | AM28F020150EI | FLASH EPROM |
| U20 | PCF12521T | DETECTOR |
| U202 | SA600DRL13 | LOW NOISE AMP & MIXER |
| U203 | TA4002F | RF AMP |
| U204 | TC7W04F | INVERTER (TRI) |
| U205 | UY10143A | BIF |
| U207 | UY10139A | DIGIPHASE |
| U210 | TA4004FT5LMATUT | OP AMP |
| U211 | UY10144A | VCO |
| U212 | PF0140 | PA MODULE |
| U213 | MC33072AD | OP AMP |
| U216 | END3043A | TCVCXO (UY10145A) |
| U217 | TC7W04F | INVERTER (TRi) |
| U218 | TA4004FT5LMATUT | OP AMP |
| U230 | TA4004FT5LMATUT | OP AMP |
| U231 | TA4004FT5LMATUT | OP AMP |
| U3 | AM28F020150EI | FLASH EPROM |
| U31 | S81337HGKET1 | REGULATOR |
| U4 | HM628128ALT85L | SRAM |
| U44 | MC33202D | OP AMP |
| U45 | TC7S04FU | INVERTER |
| U46 | TC7S04FU | INVERTER |
| U47 | TA75W393FU | OP AMP |
| U48 | MIC295102BM | REGULATOR (T&R) SPNO 20001 |
| U49 | TA75S01F | OP AMP |
| U5 | HM628128ALR85L | SRAM |
| U6 | RTC4553B | REAL TIME CLOCK |
| U7 | AT28C6415TI | EEPROM |
| W1000 | WW10019C | MIC WIRE (WHITE) |
| W1001 | WW10020C | MIC WIRE (BLACK) |
| W1002 | WW70005A | EARPIECE WIRE (RED) |
| W1003 | WW70006A | EARPIECE WIRE (BLACK) |
| W201 | MXRG76XX1400C1 | G2 RF CABLE |

### 10.1.2 Car Mount Kit - Detailed Parts List (Circuit Components)

Refer to Chapter 9 for pcb component layout diagrams

| Ref. | Part Number | Description |
|---|---|---|
| C501 | GRM40Y5V104Z25 | 100NF CAPACITOR |
| C502 | GRM40Y5V104Z25 | 100NF CAPACITOR |
| C503 | GRM40Y5V104Z25 | 100NF CAPACITOR |
| C504 | ECST1AX106ZR | 10U/10V CAPACITOR |
| C505 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C506 | GRM40Y5V104Z25 | 100NF CAPACITOR |
| C507 | ECST1CC106ZR | 10U/16V CAPACITOR |
| C508 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C511 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C512 | GRM40Y5V104Z25 | 100NF CAPACITOR |
| C513 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C514 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C515 | GRM40Y5V104Z25 | 100NF CAPACITOR |
| C516 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C517 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C518 | ECST1CY105ZR | 1U/16V CAPACITOR |
| C519 | ECST1CY105ZR | 1U/16V CAPACITOR |
| C520 | GRM39X7R681K50 | 680PF CAPACITOR 1608 |
| C521 | GRM39X7R681K50 | 680PF CAPACITOR 1608 |
| C522 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C523 | GRM39X7R332K50 | 3.3NF CAPACITOR 1608 |
| C524 | GRM40Y5V104Z25 | 100NF CAPACITOR |
| C525 | GRM39C0G331J50 | 330PF CAPACITOR 1608 |
| C526 | GRM40Y5V104Z25 | 100NF CAPACITOR |
| C527 | ECST1CY105ZR | 1U/16V CAPACITOR |
| C528 | GRM40Y5V104Z25 | 100NF CAPACITOR |
| C529 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C530 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C531 | GRM40X7R223K50 | 22NF CAPACITOR |
| C532 | GRM39C0G331J50 | 330PF CAPACITOR 1608 |
| C533 | ECST1VY334ZR | .33U/35V CAPACITOR |
| C534 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C535 | ECST1AX106ZR | 10U/10V CAPACITOR |
| C536 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C537 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C538 | ECST1CY105ZR | 1U/16V CAPACITOR |
| C540 | GRM40Y5V104Z25 | 100NF CAPACITOR |
| C541 | ECST1CY105ZR | 1U/16V CAPACITOR |
| C542 | GRM39C0G330J50 | 33PF CAPACITOR 1608 |
| C543 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C544 | ECST1CY105ZR | 1U/16V CAPACITOR |
| C545 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C546 | GRM40Y5V104Z25 | 100NF CAPACITOR |
| C547 | GRM39X7R392K50 | 3.9NF CAPACITOR 1608 |
| C548 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C549 | GRM40Y5V104Z25 | 100NF CAPACITOR |
| C550 | ECST1AX106ZR | 10U/10V CAPACITOR |
| C551 | GRM40Y5V333Z16 | 330NF CAPACITOR |
| C552 | ECST1VC335ZR | 3.3U/35V CAPACITOR |
| C553 | ECST1VC335ZR | 3.3U/35V CAPACITOR |
| C554 | ECEA1EU221 | 220U/25V CAPACITOR |
| C556 | GRM40X7R473K25 | 47NF CAPACITOR |
| C557 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C558 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C559 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C560 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C561 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C562 | GRM39C0G470J50 | 47PF CAPACITOR 1608 |
| C563 | GRM39C0G470J50 | 47PF CAPACITOR 1608 |

| Ref. | Part Number | Description |
|---|---|---|
| C564 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C565 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C567 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C568 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C569 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C570 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C571 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C572 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C573 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C574 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C575 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C576 | GRM39C0G470J50 | 47PF CAPACITOR 1608 |
| C577 | GRM39C0G470J50 | 47PF CAPACITOR 1608 |
| C578 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C579 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C580 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C581 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C582 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C583 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C584 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C586 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C587 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C588 | GRM40Y5V104Z25 | 100NF CAPACITOR |
| C590 | ECEA1CU102 | 1000U/16V CAPACITOR |
| C591 | ECST1VC335ZR | 3.3U/35V CAPACITOR |
| C592 | GRM40Y5V104Z25 | 100NF CAPACITOR |
| C593 | ECST1CY105ZR | 1U/16V CAPACITOR |
| C594 | ECST1AX106ZR | 10U/10V CAPACITOR |
| C595 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C596 | GRM40X7R223K50 | 22NF CAPACITOR |
| C597 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C598 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C599 | GRM40Y5V104Z25 | 100NF CAPACITOR |
| C6003 | GRM39C0G030D50 | 3PF CAPACITOR 1608 |
| C6004 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C6005 | ECEV1EV100SP | 10U/25V CAPACITOR |
| C6006 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C6007 | ECEV1CV100SR | 10U/16V CAPACITOR |
| C6008 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C6009 | ECEV1EV100SP | 10U/25V CAPACITOR |
| C601 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C6010 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C6011 | ECST1AX106ZR | 10U/10V CAPACITOR |
| C6012 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C6013 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C6014 | ECST1AY475ZR | 4.7U/10V CAPACITOR |
| C6015 | GRM39Y5V104Z25 | 100NF CAPACITOR 1608 |
| C6016 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C6017 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C6018 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C602 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C6022 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C6024 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C6025 | GRM39C0G181J50 | 180PF CAPACITOR 1608 |
| C603 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C6030 | GRM39C0G010C50 | 1PF CAPACITOR 1608 |
| C604 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C605 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C606 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C607 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C608 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C6089 | GRM39C0G020J50 | 2PF CAPACITOR 1608 |
| C609 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |

| Ref. | Part Number | Description |
|---|---|---|
| C610 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C6101 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C6102 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C6103 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C6104 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C611 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C6111 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C6112 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C6113 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C612 | ECEV1EV100SP | 10U/25V CAPACITOR |
| C613 | ECST1AX106ZR | 10U/10V CAPACITOR |
| C614 | GRM40Y5V104Z25 | 100NF CAPACITOR |
| C615 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C6153 | GRM39C0G100D50 | 10PF CAPACITOR 1608 |
| C616 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C617 | GRM39Y5V104Z25 | 100NF CAPACITOR 1608 |
| C618 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C619 | GRM39C0G470J50 | 47PF CAPACITOR 1608 |
| C620 | ECEV1EV100SP | 10U/25V CAPACITOR |
| C6203 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C6204 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C6205 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C621 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C622 | GRM39C0G680J50 | 68PF CAPACITOR 1608 |
| C623 | GRM39C0G100D50 | 10PF CAPACITOR 1608 |
| C625 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C626 | GRM39C0G470J50 | 47PF CAPACITOR 1608 |
| C627 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C628 | GRM39C0G330J50 | 33PF CAPACITOR 1608 |
| C629 | GRM39C0G330J50 | 33PF CAPACITOR 1608 |
| C630 | GRM39C0G470J50 | 47PF CAPACITOR 1608 |
| C631 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C632 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C633 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C634 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C635 | GRM39Y5V104Z25 | 100NF CAPACITOR 1608 |
| C636 | GRM39C0G471J50 | 470PF CAPACITOR 1608 |
| C637 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C638 | GRM39C0G030C50 | 3PF CAPACITOR 1608 |
| C639 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C640 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C6404 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C641 | GRM39C0G100D50 | 10PF CAPACITOR 1608 |
| C642 | GRM39Y5V104Z25 | 100NF CAPACITOR 1608 |
| C6439 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C6441 | GRM39C0G470J50 | 47PF CAPACITOR 1608 |
| C6442 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C6444 | GRM39C0G470J50 | 47PF CAPACITOR 1608 |
| C6464 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C6467 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C6468 | GRM39C0G180J50 | 18PF CAPACITOR 1608 |
| C6501 | GRM39C0G470J50 | 47PF CAPACITOR 1608 |
| C654 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C656 | GRM39C0G330J50 | 33PF CAPACITOR 1608 |
| C658 | GRM39C0G050D50 | 5PF CAPACITOR 1608 |
| C659 | GRM39C0G030D50 | 3PF CAPACITOR 1608 |
| C661 | GRM39C0G220J50 | 22PF CAPACITOR 1608 |
| C663 | GRM39C0G270J50 | 27PF CAPACITOR 1608 |
| C664 | GRM39C0G150J50 | 15PF CAPACITOR 1608 |
| C665 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C668 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C670 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C671 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |

| Ref. | Part Number | Description |
|---|---|---|
| C672 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C674 | GRM39C0G010C50 | 1PF CAPACITOR 1608 |
| C675 | GRM39C0G010C50 | 1PF CAPACITOR 1608 |
| C676 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C678 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C679 | GRM39X7R103K50 | 10NF CAPACITOR 1608 |
| C681 | GRM39C0G101J50 | 100PF CAPACITOR 1608 |
| C682 | GRM39C0G010C50 | 1PF CAPACITOR 1608 |
| C6966 | GRM39X7R102K50 | 1NF CAPACITOR 1608 |
| C6970 | ECEA1EU331 | 330U/25V CAPACITOR |
| D501 | MA738TX | DIODE |
| D502 | RD30PT1 | DIODE ZENER 30V |
| D503 | MA8160MTX | DIODE ZENER 16V |
| D504 | DAP202UT106 | DIODE ARRAY |
| D507 | DA204UT107 | DIODE ARRAY |
| D508 | MA8051L | DIODE ZENER 5V1 |
| D601 | AU0130F | DIODE |
| D602 | MA721 | DIODE |
| D603 | MA3160M | ZENER DIODE |
| D605 | MA151ATX | DIODE |
| D606 | HSMS2805 | DETECTOR DIODE |
| D608 | BAS16A6P | DIODE |
| D609 | BAV99A7P | DIODE |
| D6099 | BAV99A7P | DIODE |
| D610 | BZX84C4V7TRL | ZENER DIODE |
| D612 | MA151KTX | DIODE |
| D613 | BZX84C6V2L | ZENER DIODE |
| DS505 | LU5351JM | LED |
| DS506 | LU5351JM | LED |
| EG1 | EG70003B | G2 BOOSTER PCB |
| EG1 | EG70002A | HF PCB |
| EG2 | AP10118E | H/F CHARGER PCB |
| FL601 | EZFS902R947F | TX/RX FILTER |
| FL602 | LFC3001B0869B0 | 869 MHZ BPF |
| FL603 | MFK947CS12 | 935-960MHZ BPF |
| FL604 | LFC3001B0869B0 | 869 MHZ BPF |
| FL605 | LFC3001B0869B0 | 869 MHZ BPF |
| FL607 | MFK902CS12 | 890-915MHZ BPF |
| FL608 | LDC40B140J0900A | FILTER |
| J501 | HSJ083601500 | MICROPHONE JACK |
| J601 | DF1112DP2V | 12 PIN MALE CN |
| K601 | AJZ3211 | RELAY |
| L602 | 1008CS151XKBC | 150NH INDUCTOR +/-10% |
| L605 | LL2012F10NK | 10NH INDUCTOR |
| L608 | 1008CS331XKBC | 330NH INDUCTOR +/-10% |
| L609 | LL2012F39NK | 39NH INDUCTOR |
| L611 | LL2012F6N0K | 6NH INDUCTOR |
| L625 | LL2012F10NK | 10NH INDUCTOR |
| L630 | LL2012F10NK | 10NH INDUCTOR |
| L6402 | 1008CS331XKBC | 330NH INDUCTOR +/-10% |
| L6404 | 1008CS331XKBC | 330NH INDUCTOR +/-10% |
| L6413 | 1008CS471XKBC | 470NH INDUCTOR +/-10% |
| L6422 | LL2012F56NK | 56NH INDUCTOR |
| L6423 | 0805CS150XMBC | 15NH INDUCTOR +/-20% |
| L6424 | 0805CS120XMBC | 12NH INDUCTOR +/-20% |
| LS501 | TL45W0420B | SPEAKER |
| P501 | 530471210 | H/H CONNECTOR |
| P502 | PANB00134 | CHARGER CONNECTOR |
| P503 | DF1112DP2V | 12 PIN MALE CN |
| P504 | 1754872 | SPEAKER CONNECTOR (175487-2) |
| P602 | 01783032 | 6 PIN CONNECTOR |
| Q501 | 2SC4081 | TRANSISTOR |
| Q502 | FMC1T99 | TRANSISTOR |

| Ref. | Part Number | Description |
|---|---|---|
| Q503 | FMC1T99 | TRANSISTOR |
| Q504 | DTA114TUTX | TRANSISTOR |
| Q505 | 2SB1184QRTR | TRANSISTOR |
| Q506 | IMX1T110 | TRANSISTOR |
| Q507 | IMD3T108 | TRANSISTOR |
| Q508 | IMH2T110 | TRANSISTOR |
| Q510 | FMG5T99 | TRANSISTOR |
| Q511 | FMG5T99 | TRANSISTOR |
| Q512 | FMG5T99 | TRANSISTOR |
| Q514 | FMG5T99 | TRANSISTOR |
| Q515 | IMH2T110 | TRANSISTOR |
| Q516 | FMG5T99 | TRANSISTOR |
| Q517 | FMG5T99 | TRANSISTOR |
| Q518 | DTC144EUTX | TRANSISTOR |
| Q519 | DTA143EUTX | TRANSISTOR |
| Q520 | FMG5T99 | TRANSISTOR |
| Q521 | 2SB1184QRTR | TRANSISTOR |
| Q522 | 2SC4097 | TRANSISTOR |
| Q601 | 2SC4081TX | TRANSISTOR |
| Q602 | FMG5T148 | TRANSISTOR |
| Q603 | DTA143TU | TRANSISTOR |
| Q604 | DTC114YU | TRANSISTOR |
| Q652 | BF994S | TRANSISTOR |
| Q653 | BFG196 | TRANSISTOR |
| Q654 | IMZ1T108 | TRANSISTOR |
| Q655 | IMZ1T108 | TRANSISTOR |
| Q656 | 2PB709AS | TRANSISTOR |
| R5001 | ERJ3GEYJ0R0V | 0R RESISTOR 1608 |
| R5002 | ERJ3GEYJ0R0V | 0R RESISTOR 1608 |
| R5003 | ERJ3GEYJ0R0V | 0R RESISTOR 1608 |
| R501 | ERJ12YJ102HT | RESISTOR |
| R502 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| R503 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| R504 | ERJ12YJ561H | RESISTOR |
| R505 | ERJ12YJ561H | RESISTOR |
| R506 | ERJ3GEYJ473V | 47K RESISTOR 1608 |
| R507 | ERJ3GEYJ473V | 47K RESISTOR 1608 |
| R508 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| R509 | ERJ3GEYJ473V | 47K RESISTOR 1608 |
| R510 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| R511 | ERJ3GEYJ473V | 47K RESISTOR 1608 |
| R512 | ERJ3GEYJ473V | 47K RESISTOR 1608 |
| R513 | ERJ3GEYJ104V | 100K RESISTOR 1608 |
| R514 | ERJ3GEYJ151V | 150R RESISTOR 1608 |
| R515 | ERJ3GEYJ151V | 150R RESISTOR 1608 |
| R516 | ERJ3GEYJ151V | 150R RESISTOR 1608 |
| R517 | ERJ3GEYJ151V | 150R RESISTOR 1608 |
| R518 | ERJ3GEYJ223V | 22K RESISTOR 1608 |
| R519 | ERJ3GEYJ223V | 22K RESISTOR 1608 |
| R520 | ERJ3GEYJ104V | 100K RESISTOR 1608 |
| R522 | ERJ3GEYJ105V | 1M RESISTOR 1608 |
| R527 | ERJ3GEYJ472V | 4.7K RESISTOR 1608 |
| R528 | ERJ3GEYJ472V | 4.7K RESISTOR 1608 |
| R530 | ERJ3GEYJ105V | 1M RESISTOR 1608 |
| R531 | ERJ3GEYJ124V | 120K RESISTOR 1608 |
| R532 | ERJ3GEYJ471V | 470R RESISTOR 1608 |
| R533 | ERJ3GEYJ224V | 220K RESISTOR 1608 |
| R534 | ERJ3GEYJ104V | 100K RESISTOR 1608 |
| R535 | ERJ3GEYJ123V | 12K RESISTOR 1608 |
| R536 | ERJ3GEYJ123V | 12K RESISTOR 1608 |
| R537 | ERJ3GEYJ473V | 47K RESISTOR 1608 |
| R538 | ERJ3GEYJ473V | 47K RESISTOR 1608 |
| R541 | ERJ3GEYJ103V | 10K RESISTOR 1608 |

| Ref. | Part Number | Description |
|---|---|---|
| R542 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| R543 | ERJ3GEYJ471V | 470R RESISTOR 1608 |
| R544 | ERJ3GEYJ104V | 100K RESISTOR 1608 |
| R545 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| R546 | ERJ3GEYJ333V | 33K RESISTOR 1608 |
| R547 | ERJ3GEYJ272V | 2.7K RESISTOR 1608 |
| R548 | ERJ3GEYJ332V | 3.3K RESISTOR 1608 |
| R549 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| R551 | ERJ3GEYJ102V | 1K RESISTOR 1608 |
| R552 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| R553 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| R554 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| R555 | ERJ3GEYJ333V | 33K RESISTOR 1608 |
| R556 | ERJ3GEYJ823V | 82K RESISTOR 1608 |
| R561 | ERJ3GEYJ153V | 15K RESISTOR 1608 |
| R562 | ERJ3GEYJ333V | 33K RESISTOR 1608 |
| R563 | ERJ3GEYJ223V | 22K RESISTOR 1608 |
| R564 | ERJ3GEYJ123V | 12K RESISTOR 1608 |
| R565 | ERJ3GEYJ223V | 22K RESISTOR 1608 |
| R566 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| R567 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| R568 | ERJ3GEYJ100V | 10R RESISTOR 1608 |
| R569 | ERJ3GEYJ472V | 4.7K RESISTOR 1608 |
| R570 | ERJ3GEYJ182V | 1.8K RESISTOR 1608 |
| R571 | ERJ3GEYJ100V | 10R RESISTOR 1608 |
| R572 | ERJ3GEYJ222V | 2.2K RESISTOR 1608 |
| R573 | ERJ3GEYJ473V | 47K RESISTOR 1608 |
| R576 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| R577 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| R578 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R579 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R580 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R581 | ERJ3GEYJ104V | 100K RESISTOR 1608 |
| R583 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R584 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R585 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R586 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R588 | ERJ3GEYJ224V | 220K RESISTOR 1608 |
| R589 | ERJ3GEYJ102V | 1K RESISTOR 1608 |
| R590 | ERJ3GEYJ102V | 1K RESISTOR 1608 |
| R591 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R592 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| R593 | ERJ3GEYJ473V | 47K RESISTOR 1608 |
| R594 | ERJ12YK010H | RESISTOR |
| R595 | ERJ3GEYJ330V | 33R RESISTOR 1608 |
| R596 | ERJ3GEYJ330V | 33R RESISTOR 1608 |
| R597 | ERJ3GEYJ330V | 33R RESISTOR 1608 |
| R598 | ERJ3GEYJ330V | 33R RESISTOR 1608 |
| R599 | ERJ3GEYJ0R0V | 0R RESISTOR 1608 |
| R600 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| R6001 | ERJ3GEYJ820V | 82R RESISTOR 1608 |
| R6002 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| R6003 | ERJ3GEYJ471V | 470R RESISTOR 1608 |
| R6008 | ERJ3GEYJ473V | 47K RESISTOR 1608 |
| R601 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R602 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R603 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R604 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R605 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R606 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R607 | ERJ3GEYJ102V | 1K RESISTOR 1608 |
| R608 | ERJ3GEYJ102V | 1K RESISTOR 1608 |
| R609 | ERJ3GEYJ103V | 10K RESISTOR 1608 |

| Ref. | Part Number | Description |
|---|---|---|
| R610 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| R6102 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R611 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| R612 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| R613 | ERJ12YJ102H | 1K RESISTOR 1/2W |
| R614 | ERJ3GEYJ104V | 100K RESISTOR 1608 |
| R615 | ERJ3GEYJ472V | 4.7K RESISTOR 1608 |
| R616 | ERJ3GEYJ104V | 100K RESISTOR 1608 |
| R617 | ERJ3GEYJ473V | 47K RESISTOR 1608 |
| R618 | ERJ3RHD333V | 33K RESISTOR 1608 +/-0.5% |
| R619 | ERJ3RHD333V | 33K RESISTOR 1608 +/-0.5% |
| R620 | ERJ3RHD333V | 33K RESISTOR 1608 +/-0.5% |
| R621 | ERJ3RHD333V | 33K RESISTOR 1608 +/-0.5% |
| R622 | ERJ3RHD333V | 33K RESISTOR 1608 +/-0.5% |
| R623 | ERJ3RHD333V | 33K RESISTOR 1608 +/-0.5% |
| R624 | ERJ3RHD333V | 33K RESISTOR 1608 +/-0.5% |
| R6242 | ERJ3GEYJ820V | 82R RESISTOR 1608 |
| R6243 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| R6244 | ERJ3GEYJ332V | 3.3K RESISTOR 1608 |
| R625 | ERJ3GEYJ562V | 5.6K RESISTOR 1608 |
| R626 | ERJ3GEYJ222V | 2.2K RESISTOR 1608 |
| R627 | ERJ3GEYJ271V | 270R RESISTOR 1608 |
| R628 | ERJ3GEYJ470V | 47R RESISTOR 1608 |
| R629 | ERJ3GEYJ102V | 1K RESISTOR 1608 |
| R630 | ERJ3GEYJ104V | 100K RESISTOR 1608 |
| R631 | ERJ3GEYJ470V | 47R RESISTOR 1608 |
| R632 | ERJ3GEYJ330V | 33R RESISTOR 1608 |
| R633 | ERJ3GEYJ102V | 1K RESISTOR 1608 |
| R634 | ERJ3GEYJ102V | 1K RESISTOR 1608 |
| R635 | ERJ3GEYJ682V | 6.8K RESISTOR 1608 |
| R636 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| R637 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| R638 | ERJ3GEYJ180V | 18R RESISTOR 1608 |
| R639 | ERJ3GEYJ183V | 18K RESISTOR 1608 |
| R640 | ERJ3GEYJ271V | 270R RESISTOR 1608 |
| R641 | ERJ3GEYJ102V | 1K RESISTOR 1608 |
| R642 | ERJ3GEYJ102V | 1K RESISTOR 1608 |
| R6420 | ERJ3GEYJ472V | 4.7K RESISTOR 1608 |
| R6424 | ERJ3GEYJ181V | 180R RESISTOR 1608 |
| R643 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R6432 | ERJ3GEYJ332V | 3.3K RESISTOR 1608 |
| R6434 | ERJ3GEYJ330V | 33R RESISTOR 1608 |
| R6436 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| R6437 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| R6438 | ERJ3GEYJ473V | 47K RESISTOR 1608 |
| R644 | ERJ3GEYJ331V | 330R RESISTOR 1608 |
| R6440 | ERJ3GEYJ103V | 10K RESISTOR 1608 |
| R645 | ERJ3GEYJ332V | 3.3K RESISTOR 1608 |
| R6450 | ERJ3GEYJ330V | 33R RESISTOR 1608 |
| R647 | ERJ3GEYJ182V | 1.8K RESISTOR 1608 |
| R649 | ERJ3GEYJ331V | 330R RESISTOR 1608 |
| R650 | ERJ3GEYJ102V | 1K RESISTOR 1608 |
| R6503 | EVM7LSX00B23 | VARIABLE RESISTOR |
| R6504 | EVM7LSX00B54 | VARIABLE RESISTOR |
| R6505 | EVM7LSX00B54 | VARIABLE RESISTOR |
| R651 | ERJ3GEYJ332V | 3.3K RESISTOR 1608 |
| R652 | ERJ3GEYJ180V | 18R RESISTOR 1608 |
| R653 | ERJ3GEYJ180V | 18R RESISTOR 1608 |
| R654 | ERJ3GEYJ180V | 18R RESISTOR 1608 |
| R655 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R656 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R670 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R671 | ERJ3GEYJ101V | 100R RESISTOR 1608 |

| Ref. | Part Number | Description |
|---|---|---|
| R672 | ERJ3GEYJ101V | 100R RESISTOR 1608 |
| R680 | ERJ3GEYJ390V | 39R RESISTOR 1608 |
| R681 | ERJ3GEYJ470V | 47R RESISTOR 1608 |
| R682 | ERJ3GEYJ271V | 270R RESISTOR 1608 |
| R684 | ERJ3GEYJ102V | 1K RESISTOR 1608 |
| R686 | ERJ3GEYJ472V | 4.7K RESISTOR 1608 |
| R687 | ERJ3GEYJ222V | 2.2K RESISTOR 1608 |
| U501 | NJM78L08UA | REGULATOR |
| U502 | S81350HGKD | REGULATOR 5V |
| U503 | RN5VL40ATL | VOLTAGE DETECTOR |
| U504 | MB87078PF | IC |
| U505 | L4940V10 | REGULATOR 10V |
| U506 | S81350HGKD | REGULATOR 5V |
| U507 | M37451E4GP | Use M37451E4GP |
| U508 | NJM3403AM | QUAD OP AMP |
| U509 | NJM3403AM | QUAD OP AMP |
| U511 | TC4W66F | ANALOGUE SWITCH |
| U512 | RN5VL40ATL | VOLTAGE DETECTOR |
| U513 | PC74HC123T | MULTI-VIBRATOR |
| U514 | TDA2003V | POWER AMP |
| U515 | NJM2903M | DUAL COMPARATOR |
| U516 | NJM2107F | OP AMP |
| U517 | NJM2107F | OP AMP |
| U601 | PC74HC365T | BUFFER |
| U602 | RN5VL40ATL | VOLTAGE DETECTOR |
| U603 | NJM78L05UA | REGULATOR |
| U604 | M37451SGP | BOOSTER CPU |
| U605 | MN76047LCV | MIXED ANALOG & DIGITAL IC |
| U606 | AM27C256205LI | EPROM |
| U607 | PC74HC74T | FLIP-FLOP |
| U608 | MC78M08CDT | 8V REGULATOR |
| U609 | NJM78L05UA | REGULATOR |
| U611 | SAU65 | POWER AMP |
| U612 | MC33074AD | OP AMP (QUAD) |
| U615 | TA4002F | RF AMP |
| U616 | TA4002F | RF AMP |
| U617 | TA4002F | RF AMP |
| U618 | TA4003F | RF AMP |
| U620 | TA4004FT5LMATUT | OP AMP |
| U621 | TA4004FT5LMATUT | OP AMP |
| U622 | TC7S32F | OR GATE |
| U623 | TC7W00F | NAND GATE |
| U624 | TC7S14F | SCHMITT TRIGGER |
| U625 | TC7S04F | GSM CHIP |
| U651 | EMRS51 | |
| U652 | INA02186 | LOW NOISE AMPLIFIER |
| VR529 | EVM7LSX00B24 | VARIABLE RESISTOR |
| VR550 | EVM7LSX00B25 | VARIABLE RESISTOR |
| VR559 | EVUF2AF15C54 | VARIABLE RESISTOR |
| W1 | WC10460A1 | HF-BST CABLE 3.5M |
| W2 | WC11165A | HF-HH CABLE (CURLY CORD) |
| W6000 | WC11167B | INTERCONNECTING CABLE |
| W6001 | WH10054B | RF CABLE |
| X601 | IC6103240591N | EPROM SOCKET |
| Y501 | CX5F98304K | XTAL |
| Y601 | FX10049A | XTAL |

### 10.1.3 Dual Trickle Charger - Detailed Parts List (Circuit Components)

Refer to Chapter 9 for pcb component layout diagrams

| Ref. | Part Number | Description |
|---|---|---|
| C501 | ECEA1VU220 | ALMI E. CAPACITOR 35V 22$\mu$F M |
| C502 | YGM1B103K1HT | CERAM CAPACITOR 50V 10nF K |
| C503 | ECEA1CU101 | ALMI E. CAPACITOR 16V 100$\mu$F M |
| C504 | YGM1B103K1HT | CERAM CAPACITOR 50V 10nF K |
| C505 | GRM9CH101J5H | CERAM CAPACITOR 50V 100pF J |
| C506 | GRM9CH101J5H | CERAM CAPACITOR 50V 100pF J |
| C507 | GRM9F104Z16H | CERAM CAPACIOTR 16V 0.1$\mu$F Z |
| C508 | GRM9F104Z16H | CERAM CAPACITOR 16V 0.1$\mu$F Z |
| C509 | GRM9CH470J5H | CERAM CAPACITOR 50V 47pF J |
| C510 | GRM9CH470J5H | CERAM CAPACITOR 50V 47pF J |
| C511 | GRM9CH470J5H | CERAM CAPACITOR 50V 47pF J |
| C512 | GRM9CH470J5H | CERAM CAPACITOR 50V 47pF J |
| C513 | GRM9CH470J5H | CERAM CAPACITOR 50V 47pF J |
| C514 | GRM9CH470J5H | CERAM CAPACITOR 50V 47pF J |
| D501 | MA151K | DIODE 40V 100mA |
| D502 | YDFA08C-E-TR | DIODE 200V 0.8A |
| D503 | YRB420D-T96 | DIODE |
| D504 | BR3432S | LCD |
| D505 | EBR2222SB1 | LCD RED 1.7V 20mA |
| D506 | C4110014A | ZENER DIODE 24V |
| D507 | C4110014A | ZENER DIODE 24V |
| D509 | C4110014A | ZENER DIODE 24V |
| D510 | SFPB-54 | DIODE CHIP |
| D511 | YRB420D-T96 | DIODE |
| D512 | MA3100-M-TX | ZENER DIODE 10V 150mW |
| D521 | YDFA08C-E-TR | DIODE 200V 0.8A |
| D522 | YRB420D-T96 | DIODE |
| D523 | BR3432S | LCD |
| D524 | EBR2222S11 | LCD RED 1.7V 20mA |
| D525 | C4110014A | ZNER DIODE 24V |
| D527 | YRB420D-T96 | DIODE |
| J501 | HEC0749-010 | PS CONNECTOR/J PLUG 1A DC12V |
| P501 | B2B-PH-K-S | SQ CONNECTOR/J 1A |
| P502 | B6B-PH-K-S | SQ CONNECTOR/J 1A |
| P503 | B5B-PH-K-S | SQ CONNECTOR/J 1A |
| P504 | PPC0173A | SQ CONNECTOR/P |
| Q501 | 2SB891 | TRANSISTOR |
| Q502 | DTC144EK-T96 | TRANSISTOR 40V 200mW |
| Q503 | DTA144EK-T96 | TRANSISTOR 250MHz -30V 200mW |
| Q504 | YDTB113ZK-TX | TRANSISTOR |
| Q505 | YDTB113ZK-TX | TRANSISTOR |
| Q506 | 2SD1484KT106 | TRANSISTOR NPN |
| Q507 | 2SD1484KT106 | TRANSISTOR NPN |
| Q508 | 2SD1484KT106 | TRANSISTOR NPN |
| Q521 | 2SB891 | TRANSISTOR |
| Q522 | DTC144EK-T96 | TRANSISTOR 40V 200mW |
| Q523 | DTA144EK-T96 | TRANSISTOR 250MHz -30V 200mW |

| Ref. | Part Number | Description |
|---|---|---|
| Q524 | YDTB113ZK-TX | TRANSISTOR |
| Q525 | 2SD1484KT106 | TRANSISTOR NPN |
| R501 | ERJ8GEY820V | CHIP RESISTOR 250 mW 82Ω G |
| R502 | ERJ8GEYG680V | CHIP RESISTOR 250 mW 68Ω G |
| R503 | ERJ8GEYG680V | CHIP RESISTOR 250 mW 68Ω G |
| R504 | ERJ8GEYJ102V | CHIP RESISTOR 125 mW 1kΩ J |
| R505 | ERJ8GEYJ103V | CHIP RESISTOR 62.5 mW 10kΩ J |
| R506 | ERJ8GEYJ103V | CHIP RESISTOR 62.5 mW 10kΩ J |
| R513 | ERJ8GEYJ331V | CHIP RESISTOR 125 mW 330Ω J |
| R514 | ERJ8GEYJ331V | CHIP RESISTOR 125 mW 330Ω J |
| R515 | ERJ8GEYJ103V | CHIP RESISTOR 62.5 mW 10kΩ J |
| R516 | ERJ8GEYG120V | CHIP RESISTOR 125 mW 12Ω G |
| R519 | ERJ8GEYG270V | CHIP RESISTOR 250 mW 27Ω G |
| R520 | ERJ8GEYG220V | CHIP RESISTOR 250 mW 22Ω G |
| R521 | ERJ8GEYG820V | CHIP RESISTOR 250 mW 82Ω G |
| R522 | ERJ8GEYG680V | CHIP RESISTOR 250 mW 68Ω G |
| R523 | ERJ8GEYG102V | CHIP RESISTOR 125 mW 1kΩ J |
| R524 | ERJ8GEYJ103V | CHIP RESISTOR 62.5 mW 10kΩ J |
| R530 | ERJ8GEYJ331V | CHIP RESISTOR 125 mW 330Ω J |
| R531 | ERJ8GEYJ331V | CHIP RESISTOR 125 mW 330Ω J |
| R532 | ERJ8GEYJ103V | CHIP RESISTOR 62.5mW 10kΩ J |
| R533 | ERJ8GEYG120V | CHIP RESISTOR 125mW 12Ω G |
| R537 | ERJ8GEYG270V | CHIP RESISTOR 250mW 27Ω G |
| R538 | ERJ8GEYJ102V | CHIP RESISTOR 125mW 1kΩ J |
| R539 | ERJ8GEYJ471V | CHIP RESISTOR 62.5mW 470Ω J |
| R551 | ERJ8GEY0R00V | CHIP RESISTOR 125mW 0Ω |
| R552 | ERJ8GEY0R00V | CHIP RESISTOR 125mW 0Ω |
| R553 | ERJ8GEY0R00V | CHIP RESISTOR 125mW 0Ω |
| R554 | ERJ8GEY0R00V | CHIP RESISTOR 125mW 0Ω |
| R555 | ERJ8GEY0R00V | CHIP RESISTOR 125mW 0Ω |
| R556 | ERJ8GEY0R00V | CHIP RESISTOR 125mW 0Ω |
| R558 | ERJ8GEY0R00V | CHIP RESISTOR 125mW 0Ω |
| R560 | ERJ8GEY0R00V | CHIP RESISTOR 125mW 0Ω |
| R563 | ERJ8GEY0R00V | CHIP RESISTOR 125mW 0Ω |
| R567 | ERJ8GEY0R00V | CHIP RESISTOR 125mW 0Ω |
| R570 | ERJ8GEY0R00V | CHIP RESISTOR 125mW 0Ω |
| R572 | ERJ8GEY0R00V | CHIP RESISTOR 125mW 0Ω |
| R573 | ERJ8GEY0R00V | CHIP RESISTOR 125mW 0Ω |
| R574 | ERJ8GEY0R00V | CHIP RESISTOR 125mW 0Ω |
| R575 | ERJ8GEY0R00V | CHIP RESISTOR 125mW 0Ω |
| R576 | ERJ8GEY0R00V | CHIP RESISTOR 125mW 0Ω |
| R577 | ERJ8GEY0R00V | CHIP RESISTOR 125mW 0Ω |
| R578 | ERJ8GEY0R00V | CHIP RESISTOR 125mW 0Ω |
| R580 | ERJ8GEY0R00V | CHIP RESISTOR 125mW 0Ω |
| R581 | ERJ8GEY0R00V | CHIP RESISTOR 125mW 0Ω |
| R583 | ERJ8GEY0R00V | CHIP RESISTOR 125mW 0Ω |
| R584 | ERJ8GEY0R00V | CHIP RESISTOR 125mW 0Ω |
| R585 | ERJ8GEY0R00V | CHIP RESISTOR 125mW 0Ω |
| R586 | ERJ8GEY0R00V | CHIP RESISTOR 125mW 0Ω |
| R587 | ERJ8GEY0R00V | CHIP RESISTOR 125mW 0Ω |

| Ref. | Part Number | Description |
|---|---|---|
| R588 | ERJ8GEY0R00V | CHIP RESISTOR 125mW 0Ω |
| R589 | ERJ8GEY0R00V | CHIP RESISTOR 125mW 0Ω |
| R590 | ERJ8GEY0R00V | CHIP RESISTOR 125mW 0Ω |
| R591 | ERJ8GEY0R00V | CHIP RESISTOR 125mW 0Ω |
| S501 | SPPB51 | MICRO SWITCH DC30V 0.1A |
| S521 | SPPB51 | MICRO SWITCH DC30V 0.1A |
| TP501 | LC-3-S-RED | TERMINAL PIN |
| TP502 | LC-3-S-BLACK | TERMINAL PIN |
| U501 | YBU5176F | OTHERS IC 4BIT CPU |
| U503 | NJM78L05A | IC BIPOLAR LINER REG 5V |
| W501 | WC1084B | CABLE W/CONNECTOR 1A 2PIN |
| W502 | 10841A | CABLE W/CONNECTOR 1A 6PIN |
| W503 | 10842A | CABLE W/CONNECTOR 1A 5PIN |
| Y501 | CSB500E | CERAM FILTER 500kHz |

## 10.2 MECHANICAL PARTS LIST

### 10.2.1 Handportable Unit - Parts List

Refer to Figure 10.1 for exploded view of Handportable Unit.

| Model No. | | Name | Handset |
|---|---|---|---|
| Item No. | Parts Symbol | Part Number | Description |
| 1 | M101 | 9R10815B | Case Assembly |
| 2 | M102 - M105 | 3B10034B | Screw |
| 3 | M106 | 5W10070A | SIM Connector Cap |
| 4 | M107 | 1B11834B | Fixing Plate |
| 5 | M108 | 1C10647C | Isolating Plate |
| 6 | M109 | 5Y10200A | SIM Holder |
| 7 | M110 | 5W10073A | Lead SW Cap |
| 8 | M111 | 1C10645B | RF Shield Lower |
| 9 | M112 | 5Y10187B | Buzzer Holder |
| 10 | M113 | 5Y10190A | Mic Holder |
| 11 | M114 | 1D10154C | Ant. Spring |
| 12 | M115 - M116 | 3Z10053B | Screw |
| 13 | M117 | 1C10646B | RF Shield Upper |
| 14 | M118 | 1B11833B | Cont. Fix Plate |
| 15 | M119 | 9R10816B | KB Assembly |
| 16 | M120 | 5U10048A | LCD Cushion |
| 17 | M121 | 5V10080B | Key Sheet |
| 18 | M122 | 5W10069B | RF Connector Cap |
| 19 | M123 | 9R10814B | Cover Assembly |
| 20 | M124 | 5C10345B | LCD Panel |
| 21 | M125 | 7D10411A | Green Label |
| 22 | M126 | 7X10284AA | Name Plate |

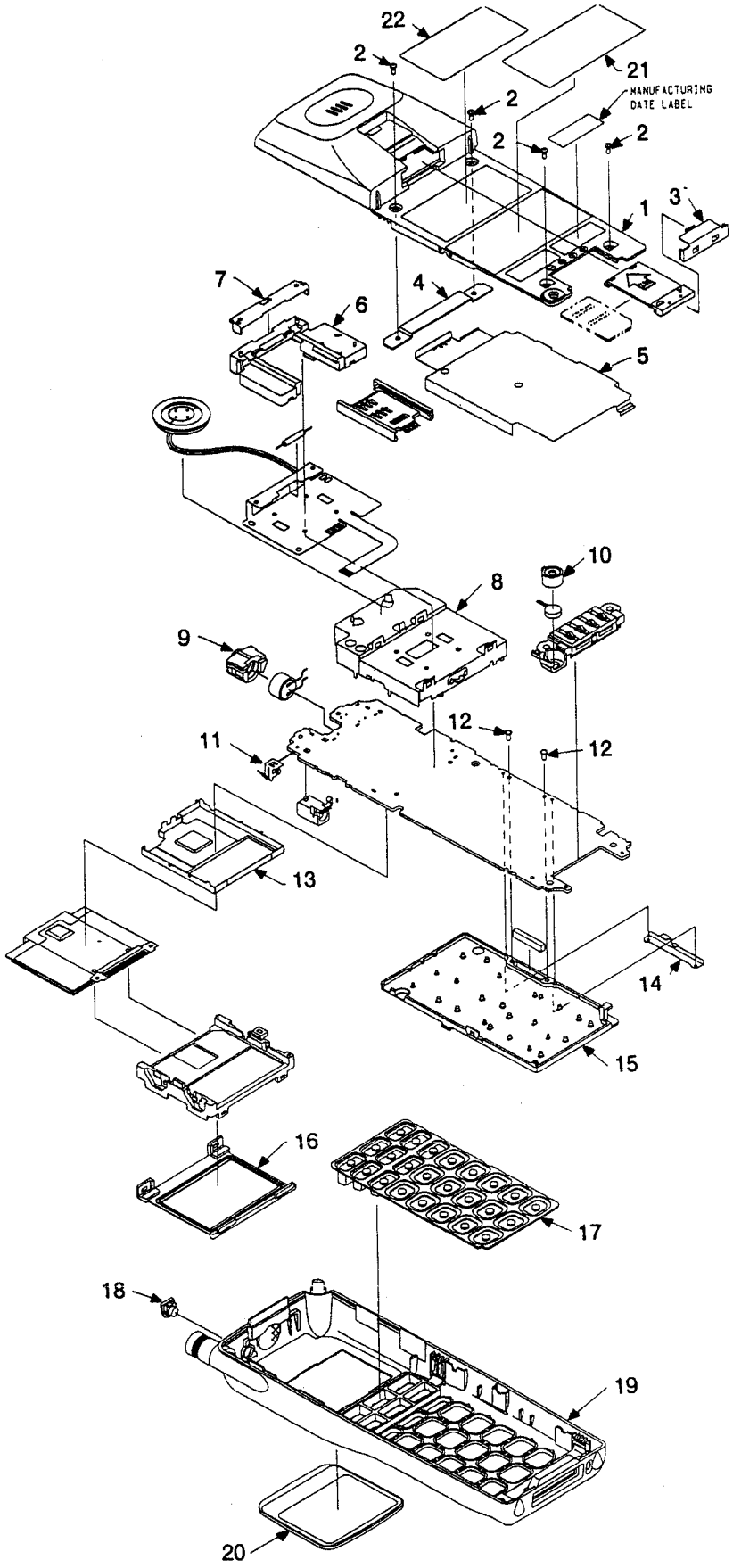


**Figure 10.1 Handportable Unit - exploded diagram**

### 10.2.2 Handsfree Cradle Unit - Parts List

Refer to Figure 10.2 for exploded view of Handsfree Cradle

| Model No. | | Name | Handsfree Cradle |
|---|---|---|---|
| Item No. | Part Symbol | Part Number | Description |
| 1 | M401 | 5N10260A | Cover |
| 2 | M402 | 5M10120A | Case |
| 3 | M403 - M404 | 5S10029B | Indicator |
| 4 | M405 | 6V10031A | SP Net |
| 5 | M406 | 4R8209B | Packing |
| 6 | M407 | 1B11218B | SP Bracket |
| 7 | M408 | 1B11758A | CN Holder |
| 8 | M409 | 7X10236AA | Name Plate |
| 9 | M411 | 7D10375A | T/A Label |
| 10 | M412 | 7AC5673C | Caution Label |
| 11 | M413 | 5E10314E | Cushion |
| 12 | M420 - M421 | XTB3 + 6GFX | Screw |
| 13 | M422 | XYN3 + J6FX | Screw |
| 14 | M423 - M424 | XSB4 + 10FZ | Screw |
| 15 | M430 - M431 | XTB4 + 16RFX | Screw |
| 16 | M440 | 1C10493B | Shield Cover |
| 17 | M441 | 1C10492C | Shield Case |
| 18 | M442 | 5H10139A | Insulator |
| 19 | M444 | 1M270900102 | Clamp |
| 20 | M445 | 5G10500A | Sheet |
| 21 | M450 | 1E10034B | Radiator |
| 22 | M451 | 5FJ5129AB | Vol Knob |
| 23 | M462 - M464 | XYN3 + J6FX | Screw |
| 24 | M470 | 5E10393A | Cushion |
| 25 | M480 | 5N10248A | Cr Cover |
| 26 | M481 | 1B11867A | MG Bracket |
| 27 | M482 - M483 | 5W10048A | Screw Cap |
| 28 | M484 | 6Z10182A | Magnet |
| 29 | M485 - M486 | 1K10430A | MG York |
| 30 | M487 | 5Y10208A | Cradle Spacer |
| 31 | M490 - M491 | XTB4 + 16RFX | Screw |
| 32 | M495 - M496 | XSB4 + 6FX | Screw |

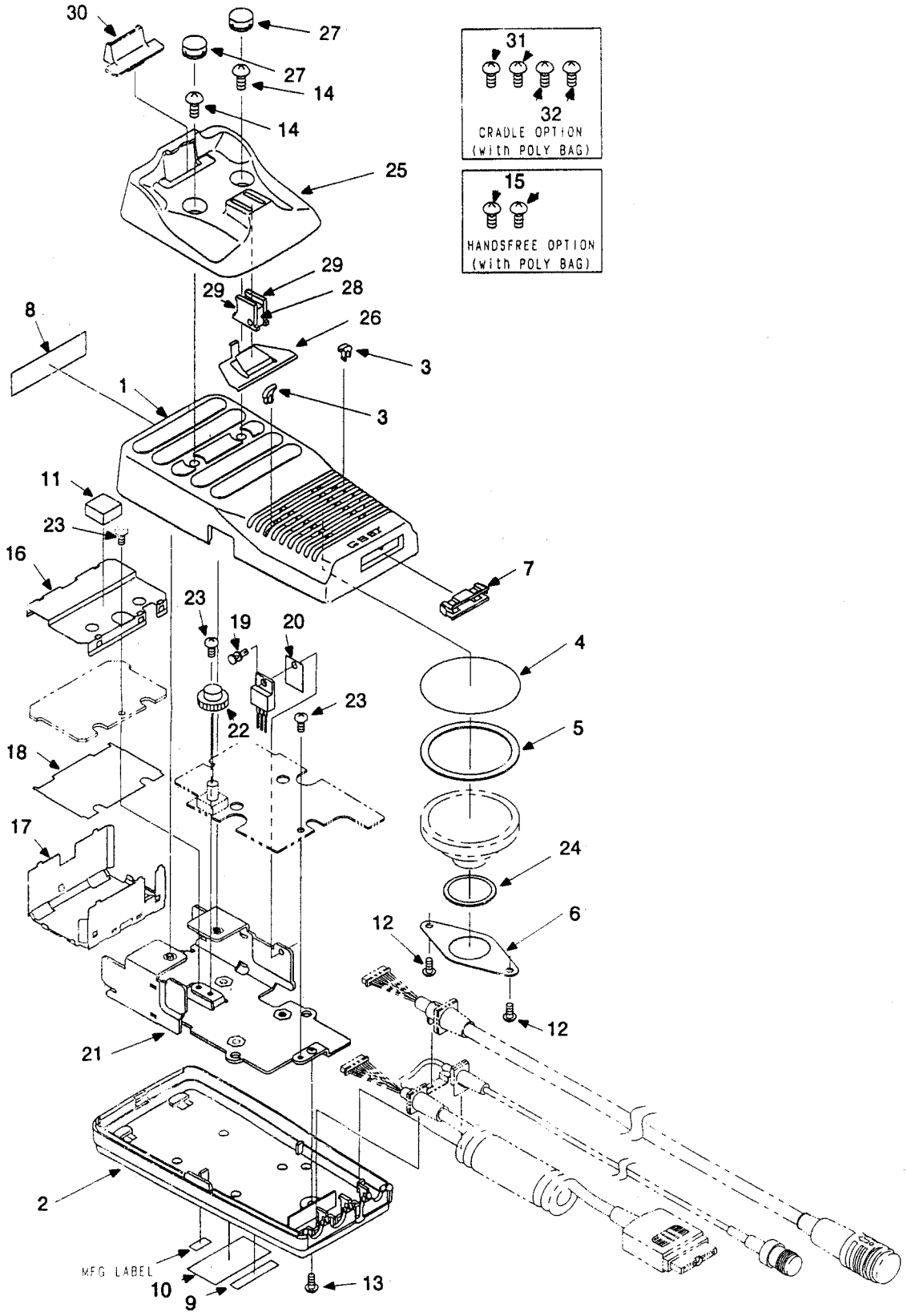


**Figure 10.2 Handsfree Cradle Unit- exploded diagram**

### 10.2.3 Booster Unit - Parts List

Refer to Figure 10.3 for exploded view of Handsfree Cradle

| Model No. | | Name | Booster |
|---|---|---|---|
| Item No. | Part Symbol | Part Number | Description |
| 1 | M601 | 5N10256A | Cover |
| 2 | M602 | 4A10015A | Case |
| 3 | M603 | 1A10361B | Base |
| 4 | M604 | 5T10045AA | Shield Tube (A) |
| 5 | M605 | 5T10045AB | Shield Tube (B) |
| 6 | M606 | 7G10421B | Panasonic Logo (L) |
| 7 | M607 | 7X10235AA | Name Plate |
| 8 | M608 | SKB 1M | Band |
| 9 | M609 | 5Y10198A | SN Spacer |
| 10 | M610 | 7D10411A | Gr Label |
| 11 | M620 - M624 | XYN3 + J8FX | Screw |
| 12 | M630 - M634 | XSB3 + 6FX | Screw |
| 13 | M640 - M641 | XSB4 + 8FXK | Screw |
| 14 | M650 - M653 | XTB4 + 25RFXK | Screw |
| 15 | M670 | 1B11202B | PA Holder |
| 16 | M671 | 1C10342A | Shield Case |
| 17 | M672 | 1C10694A | Shield Case A |

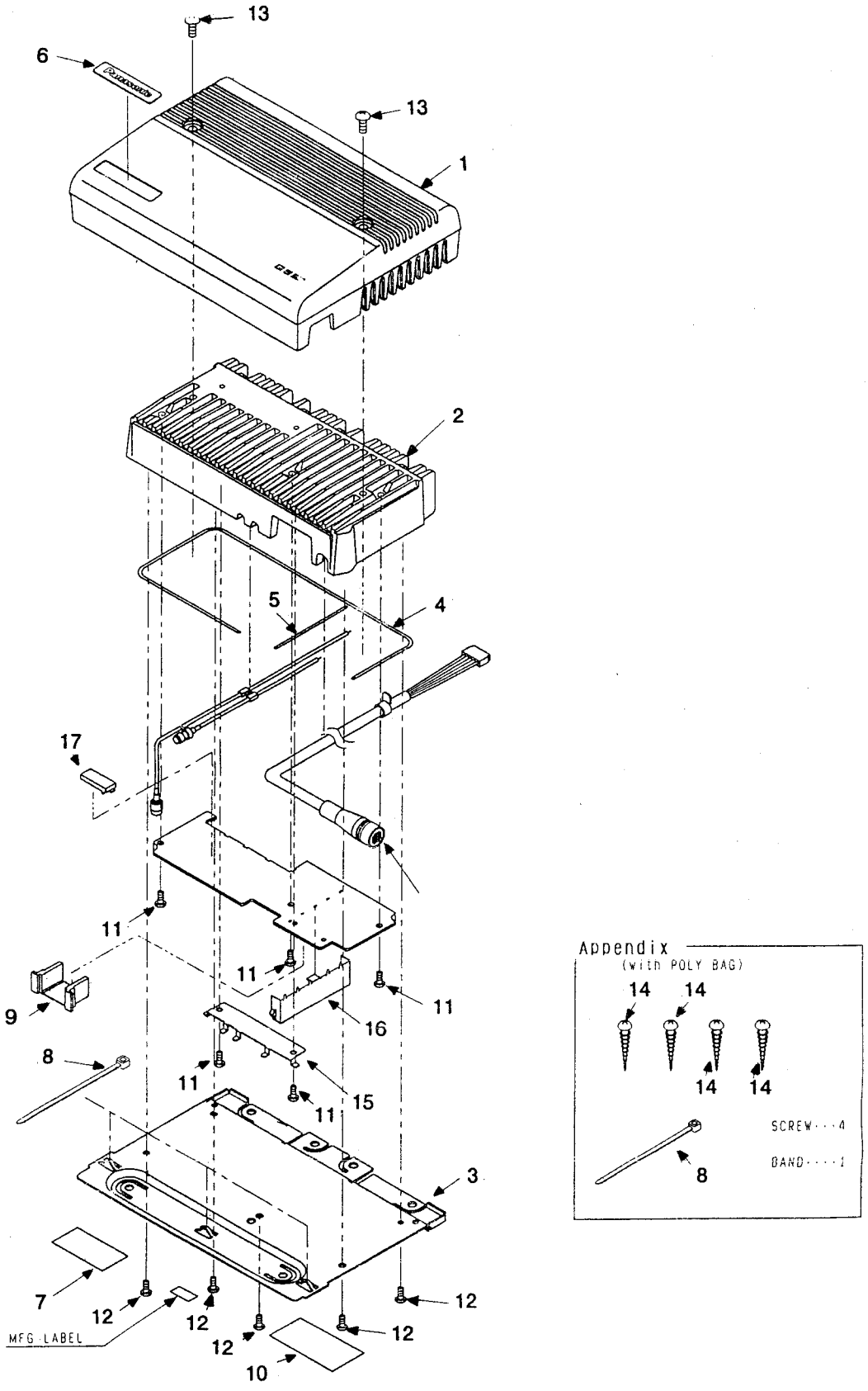


**Figure 10.3 Booster Unit - exploded diagram**

### 10.2.4 Dual Trickle Charger Unit - Parts List

Refer to Figure 10.4 for exploded view of Dual Trickle Charger Unit

| Model No. | | Name | Dual Trickle Charger |
|---|---|---|---|
| Item No. | Part Symbol | Part Number | Description |
| 0 | M300 | 5M10117A | Case |
| 1 | M301 | 2T10055A | Stand |
| 2 | M302 | 5K10156A | Rubber Foot |
| 3 | M303 | 5K10156A | Rubber Foot |
| 4 | M304 | 1B11215A | Jack Con. Bra. |
| 5 | M305 | 9R10315D | Holder R |
| 6 | M306 | 5G10371B | Blind Sheet R |
| 7 | M307 | 9R10316C | Holder L |
| 8 | M308 | 5G10370B | Blind Sheet L |
| 9 | M309 | 1E10036A | Heat Sink |
| 10 | M310 | 9R10317A | Cover |
| 11 | M311 | 5Y10133A | Plate |
| 12 | M312 | XTB3+8GFXK | Screw |
| 13 | M313 | XTB3+8GFXK | Screw |
| 14 | M314 | XTB3+8GFXK | Screw |
| 15 | M315 | XTB3+8GFXK | Screw |
| 16 | M316 | XTB3+8GFXK | Screw |
| 17 | M317 | XTB3+6GFX | Screw |
| 18 | M318 | XYN3+J8FX | Screw |
| 19 | M319 | XYN3+J8FX | Screw |
| 20 | M320 | XYN3+J8FX | Screw |
| 21 | M321 | 7G10421B | Logo |
| 22 | M322 | 7G10423A | Label |
| 23 | M323 | 7G10445A | Note Label |
| 24 | M324 | 7X10056AB | Name Plate |
| 25 | M325 | 5W10059A | S/W Cap |
| 26 | M326 | 5W10059A | S/W Cap |

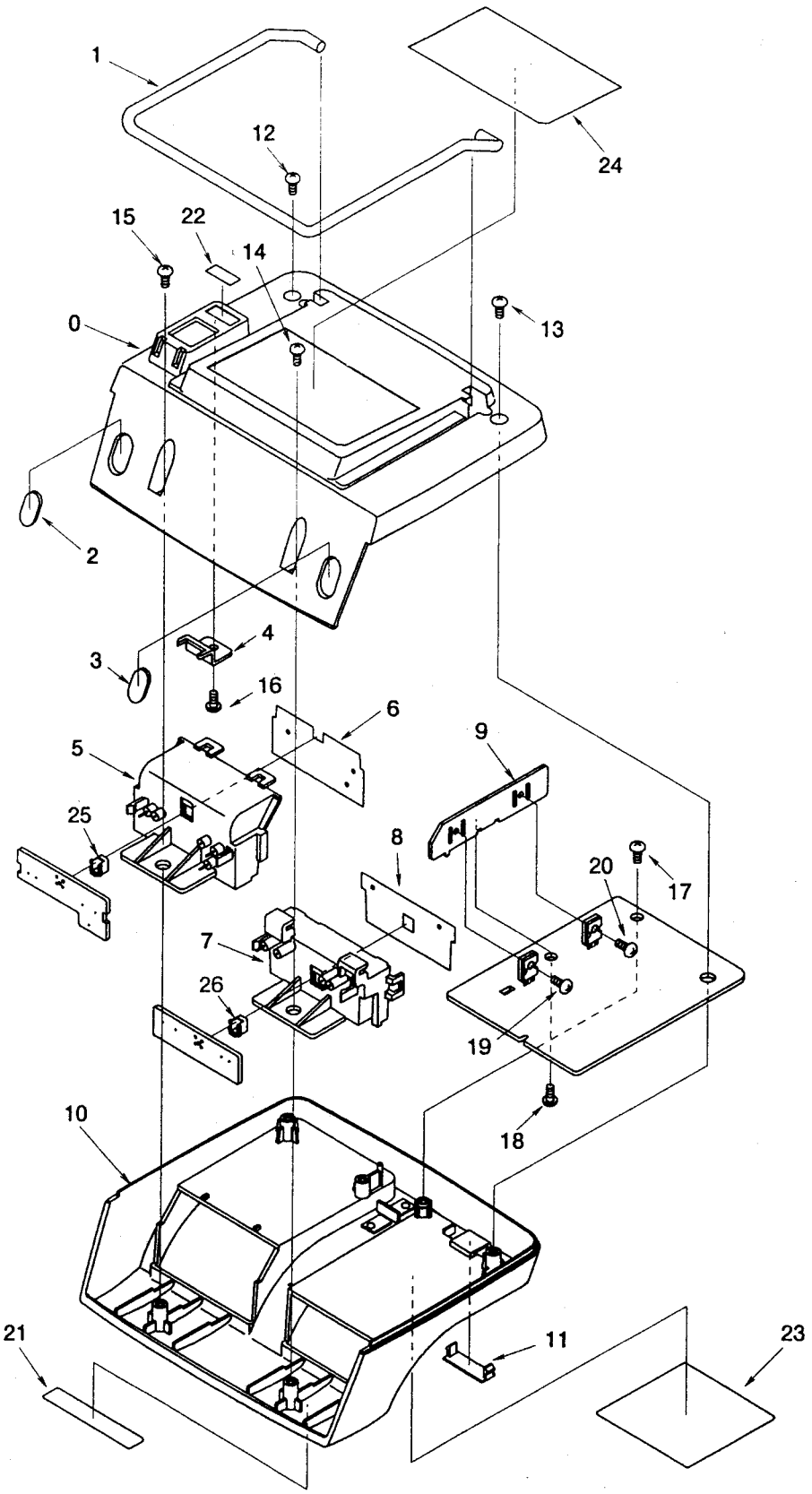


**Figure 10.4 Dual Trickle Charger - exploded diagram**